THE KENT INCORPORATED SOCIETY
FOR PROMOTING EXPERIMENTS IN
HORTICULTURE

ANNUAL REPORT

(EIGHTEENTH YEAR)

1930

I. GENERAL

EAST MALLING RESEARCH STATION

KENT

1st January, 1930, to 31st December, 1930

Published April, 1931

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E R R A T A.

EAST MALLING RESEARCH STATION.

Annual Report A.13. I-General.

Executive Committee.

Page 7. line 5. Column 2. Insert J.M. Robertson Esq.,

Publications.

Page 27. line 2. for twenty-five read thirty-four.

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CONTENTS

Section I.

PAGE

GENERAL DEVELOPMENT AND ACTIVITIES 11

Section II.

THE FARM 29

Section III.

BRIEF PROGRESS REPORT OF INVESTIGATIONS AND SUMMARIES FOR FRUIT GROWERS 35

Part I. POMOLOGY.

Progress Report 39

Publications during the Year 46

Summaries for Fruit Growers :—

The Heaviest Cropping Raspberry Varieties at East Malling. N. H. Grubb 52

Three " Rogue " Varieties of Black Currants. J. Amos .. 55

Strawberries at East Malling. Experiments in Strain, Time of Planting and De-Blossoming. W. S. Rogers 61

An Experiment in Plum Thinning. A. C. Painter 68

Part II. PHYSIOLOGY.

Progress Report 77

Publications during the Year 78

Part III. BIOCHEMISTRY.

Progress Report 83

Publications during the Year 84

Part IV. PLANT PATHOLOGY. MYCOLOGY AND BACTERIOLOGY.

Progress Report 87

Publications during the Year 90

Summary for Fruit Growers :—

The Causes of " Running Out " and Non-Cropping of the Raspberry. R. V. Harris 95

PAGE

Part V. ENTOMOLOGY.

Progress Report 101
Publications during the Year 104

Summaries for Fruit Growers:

The Strawberry Tarsonemus. A. M. MASSEE 109
The Relative Value of Tar-Distillate Washes, Spring Washes and Grease-Banding in any Scheme of Insect Control. A. M. MASSEE 111

Part VI. HOPS.

Progress Report 123
Publication during the Year 124

Part VII. METEOROLOGICAL OBSERVATIONS.

Weather Conditions during 1930 127
Summary of Meteorological Observations during 1930 129

Part VIII. LIST OF PUBLISHED REPORTS *inset following page* 130

LIST OF NEW MEMBERS AND SUBSCRIBERS DURING THE YEAR 1930 133

RULES OF MEMBERSHIP AND COMPLETE LIST OF MEMBERS OF THE SOCIETY 139

COMMITTEE OF MANAGEMENT.

Appointed by the Ministry of Agriculture:

Sir F. W. KEEBLE, D.Sc., F.R.S., Hammels, Boar's Hill, Oxford.

Appointed by the Kent County Council:

The Right Hon. Lord CORNWALLIS OF LINTON, C.B.E., T.D., D.L., J.P., Chairman K.C.C. (*ex-officio*), Linton Park, Maidstone, Kent. (Resigned during year 1930.)

F. W. PAYNE, Esq., C.C., Chairman K.C.C. (*ex-officio*), Rose Bank, 55 Anerley Park, S.E.20. (Appointed during year 1930.)

Sir W. W. BERRY, K.B.E., J.P., Gushmere Court, nr. Faversham, Kent.

G. E. CHAMPION, Esq., Linton, Maidstone, Kent.

Appointed by the Surrey County Council:

S. S. BOORMAN, Esq., Send, Woking, Surrey.

Appointed by the East Sussex County Council:

E. S. ATTRELL, Esq., Warren Fruit Farm, North Common, Chailey, Sussex.

Appointed by the West Sussex County Council:

F. H. PADWICK, Esq., C.B.E., M.A., J.P., The Red House, West Ashling, Chichester.

Appointed by the South-Eastern Agricultural College:

R. M. WILSON, Esq., B.Sc.Agric., Principal, The College, Wye, Kent.

E. HARDY, Esq., Boughton Court, Ashford, Kent.

Hon. W. E. C. JAMES, Northbourne Court, Eastry, Kent.

Appointed by the Research and Advisory Committee, S.E.A. College, Wye:

Professor V. H. BLACKMAN, Sc.D., F.R.S., F.L.S., Imperial College, South Kensington, London, S.W.7.

Representing the Long Ashton Horticultural Research Institution:

Professor B. T. P. BARKER, M.A. (Director), (*ex-officio*), Long Ashton, nr. Bristol.

Representing the John Innes Horticultural Institution:

Sir DANIEL HALL, K.C.B., M.A., F.R.S. (Director), (*ex-officio*), Merton, Surrey.

Representing the Cambridge University Horticultural Research Station.

Sir R. H. BIFFEN, M.A., F.R.S. (*ex-officio*), School of Agriculture, Cambridge.

Appointed by the National Farmers' Union (Kent Branch):

A. DAY, Esq., Tong Farm, Headcorn, Kent.

B. R. DIXON, Esq., Cambridge, Greenstreet, Sittingbourne, Kent.

W. T. EDMONDS, Esq., Allington House, Maidstone, Kent.

T. T. HARLOW, Esq., C.C., The Pines, Matfield, Kent.

T. D. HARRIS, Esq., C.C., Tudeley Hall, Tonbridge, Kent.

J. KITCHIN, Esq., J.P., Boughton Place, Sandway, Kent.

P. MANWARING, Esq., J.P., 4 Knole Paddock, Sevenoaks, Kent.

S. W. MOUNT, Esq., Hode Farm, Patrixbourne, Canterbury, Kent.

T. NEAME, Esq., The Offices, Macknade, Faversham, Kent.

J. A. RAYNHAM, Esq., Dairy Farm, Marden, Kent.

J. M. ROBERTSON, Esq., Beluncle, Hoo, Rochester, Kent.

W. ROGERS, Esq., C.C., The Court Lodge, Horton Kirby, Kent.

Appointed by the Horticultural Trades' Association:

W. R. OLDHAM, Esq., J.P., The Nurseries, Windlesham, Surrey. (Resigned during year 1930.)

L. J. COOK, Esq., Stuart Low & Coy., Enfield, Middlesex. (Appointed during year 1930.)

Appointed by the Institute of Brewing:

ARTHUR L. STERN, D.Sc. (Lond.), Research Department, Institute of Brewing, Brewers' Hall, Addle Street, London, E.C.2.

Honorary Members:

The Right Hon. Lord CORNWALLIS OF LINTON, C.B.E., T.D., D.L., J.P., Linton Park, Maidstone, Kent.

Professor E. S. SALMON, F.L.S. (*ex-officio*), The Research and Advisory Section, The College, Wye.

PERCY GATES, Esq., *The President* (*ex-officio*), The Institute of Brewing, Brewers' Hall, Addle Street, London, E.C.2.

H. V. TAYLOR, Esq., O.B.E., A.R.C.Sc., B.Sc., Ministry of Agriculture and Fisheries.

MEMBERS OF THE EXECUTIVE COMMITTEE.

Prof. B. T. P. Barker, M.A. (*ex-officio*).

Sir R. H. Biffen, M.A., D.Sc., F.R.S. (*ex-officio*).

Prof. V. H. Blackman, Sc.D., F.R.S., F.L.S.

W. T. Edmonds, Esq.

Sir Daniel Hall (*ex-officio*).

J. Kitchin, Esq., J.P.

P. Manwaring, Esq., J.P. (Chairman).

S. W. Mount, Esq.

W. R. Oldham, Esq., J.P. (Resigned during year.)

L. J. Cook, Esq. (Appointed during year.)

J. A. Raynham, Esq.

W. Rogers, Esq., C.C. (Vice-Chairman).

Dr. A. L. Stern, D.Sc. (Lond.).

R. M. Wilson, Esq., B.Sc.Agric.

Honorary Members:

The Right Hon. Lord Cornwallis of Linton, C.B.E., T.D., D.L., J.P., Linton Park, Maidstone, Kent.

Professor E. S. Salmon, F.L.S. (*ex-officio*), The Research and Advisory Section, The College, Wye.

H. V. Taylor, Esq., O.B.E., A.R.C.Sc., B.Sc., Ministry of Agriculture and Fisheries.

STAFF.

Director : RONALD G. HATTON, M.A. (Oxon.), V.M.H.

Assistant Director : R. C. KNIGHT, D.Sc. (Lond.), D.I.C.

Technical Officer : N. B. BAGENAL, B.A. (Cantab.).

Pomology : R. G. HATTON.

N. H. GRUBB, M.S.A. (Cornell).

W. S. ROGERS, M.A., Dip. Hort. (Cantab.).

J. AMOS, N.D.H., *Manager* Recorder.

A. W. WITT, N.D.H., *Propagator* and Recorder.

H. M. TYDEMAN, Assistant Recorder, *Plant Breeding.*

Miss A. D. MACKENZIE, Dip. Hort. Sci. (Oxford and Reading), In charge of records.

A. C. PAINTER, Assessor of Market qualities.

R. J. GARNER, N.D.H., Dip. Hort. Sci. (Reading), Assistant Recorder.

F. H. BEARD, Hort. Dip. (Wye), Assistant Recorder, *Hops.*

W. A. BANE, B.Sc.Hort. (Reading), Assistant Recorder, *Soil Survey.*

D. H. HAMMOND, Assistant Recorder, *Propagation.*

W. R. N. B. BARNETT, Dip. Hort. Sci. (Reading), Assistant Recorder, *Soil Survey.*

Miss B. CARTER, B.Sc.Hort. (Lond.), Assistant Recorder.

Miss A. B. BEAKBANE, B.Sc.Hort. (Lond.), Assistant Recorder.

Plant Physiology : R. C. KNIGHT, of the Imperial College of Science and Technology.

M. C. VYVYAN, M.A. (Cantab.).

Lab. Assistant : Miss I. D. SKINNER.

Mycology and Bacteriology : H. WORMALD, D.Sc. (Lond.), A.R.C.Sc., D.I.C.

R. V. HARRIS, B.Sc. (Lond.), A.R.C.Sc., D.I.C.

M. H. MOORE, Dip. Hort. Sci. (Reading), Special Assistant, *Spraying Trials.*

Miss J. B. HAMOND, B.Sc. (Lond.), Special Assistant, *Walnut* Propagation and Diseases.

Lab. Assistants : C. CORNFORD and Miss K. CORNFORD.

Entomology : A. M. MASSEE, F.E.S.

W. STEER, B.A. (Cantab.).

Lab. Assistant ; T. ABBOTT.

Bio-Chemistry : W. A. ROACH, B.Sc. (Lond.), A.R.C.Sc., D.I.C., A.I.C.

Lab. Assistant : O. USMAR.

Statistics: T. N. HOBLYN, Hort. Dip. (Wye).
E. G. H. DAY, M.I.H., Assistant Computer.

Guide Demonstrator and Exhibitions Officer: H. C. CHAPELOW, Meteorological Records.

Advisory Officer in Commercial Fruit Growing to the Kent County Council stationed at East Malling, Kent; W. G. KENT, N.D.H.

ADMINISTRATION.

Secretary: Miss M. K. GLOVER, F.I.S.A.

Book-keeper: P. R. WOOD.

Director's Personal Secretary: Miss L. E. ALEXANDER.

Clerical Staff: Administrative: Miss E. M. SHEPHERD, Mrs. E. D. HUGHES, Miss E. M. LAWSON, Miss A. M. COSTIN.

" " *Technical:* Miss M. E. DAY, Miss M. J. COOPER (services shared with Bureau).

THE IMPERIAL BUREAU OF FRUIT PRODUCTION
is accommodated at East Malling Research Station.

STAFF.

Director: R. G. HATTON, M.A. (Oxon.), V.M.H.

Chief Officer: D. AKENHEAD, M.A. (Oxon.), B.Sc.Agric. (Lond.).

Assistant: G. St. C. FEILDEN, B.A. (Oxon).

Secretary: Miss H. MCKEAGUE, B.A. (Belfast).

Shorthand-Typists: Miss H. WHITEHEAD, Miss M. J. COOPER.

Telephone: Imperial Bureau of Fruit Production—(Aylesford 7188).

VISITORS.

Visits may be paid to the Research Station on any week day *by appointment* (Saturday afternoon only under exceptional circumstances).

Passenger Station: East Malling Halt. Southern Railway.

Goods Station: Aylesford.

Bus Services by the Maidstone and District Bus Co., every 20 minutes from Maidstone to East Malling Church.

Ditton Corner on the main London—Maidstone Road (with Red Lamp Danger Signal) is the turning to the Research Station for visitors coming by road.

Telephones; The Station is now served by two lines:
Research Station, *Administrative*—(Aylesford 7229).
Research Station, *Advisory and Technical Service*—(Aylesford 7189).

Section I

General Development and Activities

Section I.

GENERAL DEVELOPMENT AND ACTIVITIES.

Perhaps the most outstanding development of the year has been the setting up of the Technical Section in the new (Empire Marketing Board) building. With the establishment of this section, with its own clerical staff and separate offices and telephone, the Administrative Staff has been relieved of the responsibility of all outside contacts of a non-administrative nature, and has thus been left unhindered to concentrate upon the ever-increasing problems connected with administration and finance.

It will be remembered that this development was made possible by the Empire Marketing Board Grant, in return for which the Station undertook to create facilities for receiving a limited number of Post-Graduate workers. Such facilities were accordingly created and the number of requests for particulars which have since been received shows the existence of a keen demand for the services which are offered in our post-graduate scheme.

With the departure of Mr. Hatton for his six months' tour of the fruit growing Dominions, it was not unnaturally decided to defer the final arrangements for the reception of Post-Graduates under the scheme until Mr. Hatton's return.

Two other important developments of the year have been the establishment of the Imperial Bureau of Fruit Production in the new Empire Marketing Board Building, and the commencement of work by the Ditton Laboratory, a few hundred yards from our doors.

Brief references to the Bureau are made elsewhere in this report and full particulars relating to their many and varied activities during the year will be available in due course from their own reports, but in so far as the presence of the Bureau in our midst cannot fail to react upon the life of our own Station, it is pleasant to note in passing the extraordinary degree of harmony which it appears possible to retain between two institutions under one roof.

Unquestionably the most important activity to report in the history of this Station during the year has been the work of the various members of the Staff in connection with the large number of Horticultural Conferences which have taken place in England in 1930.

Comment in this connection is made elsewhere in this Report, but it may be said here that the ever-increasing tide of visitors, especially from overseas, has been considerably augmented by these conferences and that the difficult task of receiving, entertaining and in many cases of interpreting would never have been possible had it not been for the cheerful collaboration of the Officials of the Bureau.

With the occupation of the Ditton Laboratory by members of the Staff of the Cambridge Low Temperature Station, we entered on a new phase in our packing and grading work. Our Staff has worked in close collaboration with Mr. Hardy and has for the first time been able to make use of some of the economies of large-scale production.

We take occasion elsewhere in this Report to acknowledge the kindness shown by Mr. Hardy and his Staff during the past summer, and it will therefore suffice to conclude this introductory paragraph by expressing the hope that in all branches of future activities we may continue the happy relations which have already been established with our new neighbours.

COMMITTEES.

The Committee of Management have with regret to report the following resignations of two members of Committee during the past year, Lord Cornwallis and Mr. W. R. Oldham.

Lord Cornwallis had (in the capacity of Chairman of the Kent County Council) taken an active and strenuous part upon the Committee of the Research Station. His Lordship, having resigned the Chairmanship of the Kent County Council, automatically resigned from the Committee of Management of the Research Station. The Committee unanimously tendered a request to Lord Cornwallis for his consent to become an Honorary Member of the Committees of the Society. Lord Cornwallis very kindly acceded to this request.

Mr. W. R. Oldham, the appointed Member by the Horticultural Trades' Association, owing to pressure of business and outside contacts felt compelled to resign his membership of the Committee. The Committee asked Mr. Oldham to reconsider his decision but without success. Mr. Oldham, however, promised to continue his interest and also assured the Committee of his willingness to help if required.

The newly appointed Members to the Committee were cordially welcomed, namely F. W. Payne, Esq., C.C. (Chairman of the Kent County Council) and Mr. L. J. Cook, appointed by the Horticultural Trades' Association.

This being the third year since the appointment of the present Committee of Management, under paragraph 9 of the Articles of Association, all appointed Members automatically retire but are eligible for re-election.

The Committee recorded with regret the serious illness of Dr. Knight (the Assistant Director) throughout the year.

The Executive Committee met four times during the year, in addition to the meeting of seven Sub-Committees. The subjects especially considered were : Finance, the Development Scheme under the Empire Marketing Board relating chiefly to the completion of the Building Scheme, etc., Housing of Excavated Trees, Accommodation of Post Graduate Students, the Development and Endowment Fund and the Official Opening of the Buildings.

The Annual General Meeting.

The Tenth Ordinary General Meeting of the Society was held on the 28th of May, 1930.

The Seventeenth Annual Report Part I (1929), and the Balance Sheet for the year ended 30th September, 1929, were presented and approved.

The Fourth Annual Meeting of the Members of the Society again synchronised with the Ordinary General Meeting. It was gratifying to note an increasing number of members at this meeting.

The Guests and Members adjourned to the Packing Shed for luncheon and speeches. The Chairman (Mr. Percy Manwaring), welcomed the guests and introduced the speakers : The Right Hon. Christopher Addison, M.D., B.S. (Lond.), F.R.C.S. (England), M.P., Parliamentary Secretary, Ministry of Agriculture (now Minister of Agriculture) and Sir William Hardy, M.A. (Cantab), F.R.S., Director of Food Investigation, Department of Scientific and Industrial Research.

The Right Hon. Dr. Addison in his opening remarks mentioned that he was a member of the Committee of the Empire Marketing Board and although he had not previously visited East Malling Research Station, had most assuredly heard about it. He spoke of the urgency at the present time of practical research that found its way into the daily régime of the grower. The speaker emphasized the objective for which to aim, that the grower should himself become an experimenter. "We in Britain can produce fruit as good as they can anywhere."

Sir William Hardy explained the purposes and gave details concerning the structure of the Ditton Laboratory. Its object was the extension of the work of the Low Temperature Station at Cambridge, and it would provide means for the study of the physiology of fruit grown under controlled conditions. Successful storage depended among other factors upon temperature, humidity, the composition of the gas or air in which the fruit is stored. Experiments would be conducted to ascertain the effect of variable factors on the storage life of different fruits.

Sir Frederick Keeble, Principal of Jealott's Hill Research Station, Imperial Chemical Industries, thanked the speakers. Mr. E. Hardy, of Wye, seconded.

Mr. Hatton briefly outlined several aspects of the work at the Research Station.

After the Meeting, the Members were shown various phases of Laboratory and Field work from the investigator's point of view. The initial methods of approach and the unexpected problems encountered in the course of experimentation, formed the chief feature of the demonstration.

FINANCE.

The Station has received the following Maintenance Grants through the Ministry of Agriculture for the year 1st October, 1929, to 30th September, 1930:

	£	s.	d.
Research and Maintenance through the Development Fund	8,300	0	0
Research and Maintenance from the Empire Marketing Board Fund (Rootstock Investigations)	4,932	9	9
Research and Maintenance from the Empire Marketing Board Fund (Extension Scheme)	2,025	0	0

Special Grants from the Ministry of Agriculture :—

	£	s.	d.
The Incidence and Control of Apple Scab	240	0	0
Kent Fruit Soil Survey	391	3	0

The Imperial College of Science and Technology has continued its grant of £90 towards Physiological investigations.

	£	s.	d.
The Egyptian Education Office (Post Graduate Bench Fee)	37	10	0

Contributions have been received from the following County Councils for which we would record our thanks and appreciation :—

	£	s.	d.
Kent County Council	200	0	0
East Sussex County Council	100	0	0
West Sussex County Council	100	0	0

We are also again indebted for the following Donations to :—

	£	s.	d.
The United Potash Company	200	0	0
The Imperial Chemical Industries	250	0	0

We are very grateful to Mr. Howard Spence for his munificent gift to enable the work of Research on Walnut Cultivation to be established.

	£	s.	d.
Mr. Howard Spence (Walnut Cultivation Research) ..	100	0	0

The total Sales of Produce during the year amounted to £4,115 12s. 4d.

MEMBERSHIP SCHEME.

The Membership Fund again shows an increase in subscriptions for the year 1-i-1930—31-xii-1930 :

	£	s.	d.	£	s.	d.
Subscriptions	454	6	0			
Interest	9	4	7			
				463	10	7
Total				£463	10	7

New Members enrolled during the year :—

5 Associate Members, Life "Founders."
2 Associate Members, Life "Fellows."
1 Associate Member, Annual "Fellow."
1 Associate Member, Life "Associate."
33 Associate Members, Annual "Associates."

This Fund still continues to meet the following expenses :—

The Annual Report, I.—General.

The Annual General Meeting and Members' Day.

Certain expenditure towards Building Maintenance, which this year includes the layout of the ground surrounding the Manwaring Building.

For list of Subscribers *during the year* 1930 together with the complete List of Members and Rules of Membership, see pages 131-162.

DEVELOPMENT FUND—Endowment Scheme.

The Development Fund has naturally suffered from the all prevailing financial depression. Renewed efforts, however, are being made to extend the fund and we would remind our well wishers, that under the £1 for £1 agreement every little helps. The object is to provide the Station with some funds of its own so that it may not have to rely entirely upon Government Grants.

BUILDINGS.

The new Empire Marketing Board building is now completed. The Official Opening is expected to take place during the year 1931.

STAFF.

During the year several additions have been made to the Staff. Miss J. Hamond who had been a voluntary worker for the past twelve months, joined the staff on the 1st October, 1930, as " Assistant " on the Cultivation of Walnuts, a special grant having been made by the Ministry for this work for the current academic year 1930-31.

Mr. W. R. N. B. Barnett had also been working as a voluntary worker for some months. He was appointed as an Assistant Recorder on the 1st of January, 1930 to August, 1930. Mr. Barnett was successful in obtaining the appointment as " Assistant Horticultural Instructor " under the Bucks County Council on the 1st September, 1930.

Miss B. Carter and Miss A. B. Beakbane, Assistant Field Recorders, joined the Staff on the 1st October, 1930.

Mr. W. G. Kent was appointed in March, 1930, to the post of " Advisory Officer in Commercial Fruit Growing " under the Kent County Council.

Mr. Kent has office accommodation at The Research Station in the Empire Marketing Board Building, Advisory and Technical Section.

Mr. Cyril Cornford, who had been employed as a Laboratory Assistant for a period of seven years and Mr. John Cronk as an outdoor worker since April, 1929, were both successful in obtaining Scholarships admitting them to the Borden Farm Institute for one year as from 1st October, 1930.

Miss E. M. Shepherd having been a member of the Administrative Staff since May, 1921, tendered her resignation upon her marriage in July. Miss Shepherd who was a very keen worker will be greatly missed by all at the Research Station.

Miss M. E. Day was appointed to the post of Shorthand Typist to the Technical Assistant, January, 1930.

Miss M. J. Cooper also joined the Staff as Junior Clerk shared by the Technical Section and the Imperial Bureau, October, 1930.

On October 3rd, Mr. Hatton left the Station for a tour of certain fruit growing districts of the Dominions.

The tour, occupying some six months, has been arranged by the Empire Marketing Board with the object of establishing personal contact with research workers and growers in the Dominions and of obtaining first-hand knowledge of the difficulties encountered by them. It is hoped that this knowledge will prove of material assistance to the Station and the Imperial Bureau of Fruit Production in its work and that Mr. Hatton's experience of fruit matters will prove useful to the workers in the countries he visits.

The countries visited are as follows :—

Canada.
U.S.A.—Washington State, Oregon and N. California.
New Zealand, including Raratonga.
Australia, including Tasmania.
Dutch East Indies, Java.
Ceylon.

Post-Graduate and Overseas Workers.

Mr. Mahmoud Beshir, of the Plant Protection Section, Egyptian Ministry of Agriculture, who had been attached to our Entomological Section since May, 1929, left us in August to take up his duties in Egypt. During his stay here, Mr. Beshir rendered much useful service to Mr. Massee in connection with his work on Tar Distillate Sprays and the Control of Apple Blossom Weevil.

At the request of the Government of India, Mr. A. M. Mustafa, Agricultural Officer of the North West Frontier Province, spent six months here, attached to the Pomological Section, leaving in October to take a course in Plant Breeding at Cambridge University.

Miss J. Hamond, B.Sc. (Bedford College) completed in September her year's voluntary work with the Pathological Section in connection with the bacterial diseases of Walnuts.

Miss B. Carter, B.Sc. (Reading University) spent a month in the spring, working in the Biochemical Laboratory on the Biochemistry of Apple Scab.

To Miss R. F. Stern we owe once again our best thanks for invaluable voluntary help at a busy season of the year in connection with the recording of our soft fruit crops.

Short period visits to study specific aspects of our work have been paid by Mr. J. O. Irwin (Rothamsted), Dr. R. H. Marloth (South Africa), Mr. A. P. King (Hants C.C.), Mr. J. R. V. Smyth (Nigeria), Mr. E. E. Pyke (Trinidad), Mr. R. S. Thomson (Jersey), Mr. H. C. Naik (India), Mr. S. M. Murray (Cambridge University), and Mr. M. S. Ahmed (Edinburgh and Egypt).

From outside the Empire came Professor W. L. Howard (Davis, California), Professor W. Gleisberg (Pillnitz), and Mr. W. Bickel (Munich) for all too short periods of interchange of information and ideas.

Staff Meetings, 1930.

Seven meetings were held during the winter months and were well attended.

At the first meeting various members of the Staff read reports on the more important papers that they had heard when acting as the Station's representatives at the Horticultural and Botanical Conferences and Congresses during

the summer. The Chief Officer of the Imperial Bureau of Fruit Production also gave an account of his recent tour in Canada and the U.S.A.

At the other meetings, Members of the Staff read progress reports on the special investigations upon which they are engaged.

The Social and Athletic Club.

The membership at the end of the year totalled one hundred and twenty as against ninety-seven in the previous year.

The increase in membership is partly due to the fact that the staff of Ditton Laboratory have joined our Club almost in a body.

The summer outing this year was divided into two parties, one going to the Derby and the other to Winchelsea.

The Tennis Section has been active throughout the Summer, and several rambles were organised including a visit to the Court Lodge, Horton Kirby, the home of Mr. William Rogers, who kindly entertained the party to tea.

Owing to Dr. Knight's critical illness, the Christmas Supper and Party were cancelled.

Collaboration.

The full joint Staff Meeting with Long Ashton took place here on January 23rd and 24th.

The research programmes of both Stations were discussed in general at a full meeting of both the Staffs, and matters of detail were later discussed more fully at sectional meetings.

We have again supplied Mr. T. Wallace with material from our experimental plots for his analytical work, and we acknowledge, as in previous years, his close co-operation in keeping us in touch with the results of his analyses.

In connection with the Fruit Soil Survey Work, an account of which appears elsewhere, several joint meetings have been held and much joint field work has taken place in conjunction with Dr. Goodwin and Mr. Gethin Jones.

Visits have been exchanged with Members of the Staff of the John Innes Horticultural Institution in connection with experiments in the breeding of rootstocks for resistance to Woolly Aphis.

The Mycological and Biochemical Sections collaborated with Dr. A. S. Horne and Mr. M. Nitimagi in their experiments bearing upon the fungus-flora of the atmosphere in apple plantations.

Our Pathological Section have collaborated with Mr. R. Hart, of the Borden Farm Institute in a trial at Teynham for the control of Brown Rot in Cherries.

Finally, as described on page 26 our grading and packing staff have collaborated with Ditton Laboratory in the preparation of fruit for a cold storage experiment.

Advisory Work.

Correspondence.

The total number of written replies to queries was 1,288.

In the interests of research, it is essential to relieve the actual research workers so far as is possible from the burden of answering advisory letters, and we would once again urge our members to make full use of our Technical Section as a clearing house for all advisory matters, and to address all queries of a general nature direct to the Technical Assistant. In this connection, it is satisfactory to report that a separate telephone line has now been set up in the E.M.B. Building and it is hoped that all people who wish for telephonic advice on technical matters or who are anxious to make appointments to visit the Research Station *will ring up Aylesford 7189 and ask for the Technical Assistant* (Mr. Bagenal).

Once again enquiries from the main contributing Counties: Kent (342), Surrey (49), East and West Sussex (89), outnumbered those of any other individual county. Enquiries answered from the Empire and from other countries overseas have shown a decrease, because many of these referred to matters now dealt with by the Bureau, and were in consequence passed on thereto.

Visits.

The total number of visits to orchards and plantations made by members of the Staff during 1930 amounted to 212.

With the welcome arrival of Mr. W. G. Kent in June to take over the County Advisory Work we were able to hand over to him a long list of growers requiring visits, and since that date to the end of the year Mr. Kent alone has made over 150 calls on fruit-growers in this County.

In June we had two days' visit from Mr. R. M. Marsh, from Long Ashton Research Station, and in his company three of our Staff made a tour of Kent examining cases of "Die-Back" in plum trees.

The services of various members of the Staff were again in demand for judging at various shows and farm competitions.

Lectures, Demonstrations, Conferences.

Lectures.

Twenty-five lectures were delivered in the course of the year by members of the Staff, three of these being in connection with the Research Lecture

Scheme organized by the Ministry of Agriculture. Ten of the lectures dealt with diseases and pests, once more indicating the widespread interest that is taken by growers in this subject.

The Director contributed papers to the International Horticultural Congress, arranged by the Royal Horticultural Society, and to the Imperial Horticultural Conference, organized by the Imperial Bureau of Fruit Production, to which also Mr. Hoblyn contributed a paper. A number of papers were read before various scientific and other societies during the course of the year by members of Staff.

Demonstrations.

At the request of the Paddock Wood Branch of the National Farmers' Union, a pruning demonstration was given at the Research Station by Mr. N. H. Grubb on December 12th, when eighty-seven members of the Paddock Wood, Goudhurst and Lamberhurst Branches of the N.F.U. attended.

During the year Mr. A. C. Painter gave individual demonstrations in National Mark methods of marketing to several growers, and Mr. A. W. Witt was called upon on forty occasions to demonstrate different methods of vegetative propagation.

Conferences.

The year 1930 will long be remembered for its conferences, particularly in regard to matters of horticultural interest.

The Imperial Bureau of Fruit Production organized a conference in London early in August, at which horticulturists from all parts of the Empire discussed matters of economics and administration in relation to horticultural research, the adaptation of science to horticulture, and the progress of fruit storage methods.

A full report of this conference is being prepared by the Bureau and will shortly be published.

Some members of this Imperial Horticultural Conference paid a special visit here on August 10th, whilst others who were also taking part in the International Horticultural Congress came down here with a party of 150 on August 13th.

The International Horticultural Congress, being largely concerned this year with the subject of plant propagation, authorities on this subject had come together from all over the world. Among so many notabilities it would be invidious to mention individuals by name, and it will be sufficient to say that the most conspicuous absentee from the party who gathered round Dr. Knight's hardwood cutting experiments was Dr. Knight himself, whose illness made it impossible

for him to be present. In his absence Mr. Vyvyan, Mr. Witt and Mr. Garner demonstrated the various phases of his and their work in connection with plant propagation.

Other important conferences attended by members of Staff were the International Botanical Congress and the Third Imperial Entomological Conference.

A meeting of the Wye Provincial Conference was held here on the 28th March, and various members of Staff attended this conference on three other occasions during the year.

EXHIBITS.

Educational exhibits dealing with recent work at the Research Station were staged at the following Shows during the year:—Sussex County, at Hastings; Kent County, at Folkestone; South Eastern Counties, at Tunbridge Wells, and the Imperial Fruit Show at Leicester.

At the request of the Ministry of Agriculture, a selection of strawberries, packed under National Mark regulations, was sent to the Ministry's Marketing Demonstration at the Sussex County Show at Hastings, and at the request of the Norfolk Agricultural Education Committee, a small exhibit was sent to Mr. H. Goude on loan for show work.

VISITORS.

The number of our visitors has increased to 1,767 this year, an increase due largely, no doubt, to the Conferences mentioned above.

Previous to the Imperial Conference we had the pleasure of visits from the Right Hon. S. M. Bruce, ex-Prime Minister of Australia and Sir T. Vijayaraghavacharya, Vice-Chairman of the Imperial Council of Agricultural Research, India.

At a later date Mr. S. G. Tallents, Secretary of the Empire Marketing Board, brought down the Right Hon. G. W. Forbes, Prime Minister of New Zealand, Dr. H. M. Tory, President of the National Research Council of Canada; Dr. Marsden, Secretary of the New Zealand Department of Scientific and Industrial Research and the Right Hon. H. H. Stevens, Minister of Trade, Canada.

Individual visits were paid on 224 days in the year, many of these being from distant countries. A large number of overseas visitors have been referred to the Bureau of Fruit Production, and we acknowledge with gratitude the help given us in this respect by Mr. D. Akenhead and Mr. G. St. C. Feilden.

Ditton Laboratory started work this year and, owing to the very close proximity of our buildings, a certain number of enquiries have been made by our

visitors, especially from overseas, as to whether they could also visit the Cold Store experiments. In this connection we should like to thank Dr. West, Mr. Hardy, and their Staff for kindly consenting on several occasions to show our visitors round Ditton Laboratory without a previous appointment.

Organised parties have reached this year the high total of thirty-five. These included the N.F.U. Farmers' Tour, six parties from Wye College, five parties from Borden Farm Institute, three parties from Swanley College, and single parties from Reading University, Plumpton Farm Institute, Oaklands Farm Institute and from Snodland and Malling Schools.

We were especially pleased to be able to welcome, on December 9th, a party of schoolmasters who were then engaged on a refresher course at Borden, and to make contacts which we hope will be closely maintained in the future.

Recorded Visitors, 1930.

Month.	No. of days on which visits were paid.	No. of visitors per month.
January	14	54
February	11	27
March	17	89
April	16	80
May	26	260
June	21	338
July	22	240
August	24	258
September	22	117
October	18	76
November	16	101
December	17	127
	224	1,767

Fruit Soils Survey in Kent.

The pomological survey has been extended to the Folkestone Sand, records being taken on forty-one farms between Sevenoaks and Lenham Heath. In addition, three more farms on the Hythe Beds have been surveyed. The area of fruit on which notes were made was about 1,000 acres, making the total surveyed since the beginning of the Survey approximately 3,500 acres.

It is hoped to include, in the coming year, the fruit on the Lower Greensand between Egerton and the coast, and also some of that in the closely planted

Medway Valley area, with which it was impossible to deal fully in the first year's work.

The Fruit Soils Survey Sub-Committee of the Ministry of Agriculture visited the area in July and spent two days in the field. After consideration of a Joint Progress Report, a further continuance of the grant for this work was recommended.

The classification of Soil Series has been continued by the Soil Chemists, working from Wye, and a certain amount of joint work became possible as this classification, and that of the pomologists for the fruit, became more definite. While there is undoubtedly a distinct difference in tree performance on the extreme soil types of the Lower Greensand, it seems that on the intermediate types, differences due to soil may be masked by such management factors as manuring and cultivation.

A remarkable example of the effect of a pre-planting dressing of farmyard manure in a plantation of Pears, Blackcurrants and Gooseberries was further investigated by excavation and examination of the root-systems of trees and bushes on the manured and unmanured parts.

In several orchards, which from the large proportion of rushes in the herbage might have been thought unsuitable for fruit, the trees appeared to be doing well. As there is a considerable unplanted acreage of such land on the lower slopes of the escarpment, the matter was further investigated, and partial excavation carried out on the root system of a large standard Bramley's Seedling.

An examination of the occurrence of Leaf Scorch on the Lower Greensand led to the formation, in conjunction with the County Advisor in Commercial Fruit Growing, of potash demonstration plots.

In co-operation with the Statistical Section of the Research Station a sampling method was used in an investigation of the setting of the blossom of Bramley's Seedling on four Paradise Stocks on the manured and unmanured plots.

Preliminary work on the effect of aspect, altitude and soil on the blooming period of Bramley's Seedling was attempted by means of personal visits to selected plantations and by a questionnaire to growers.

As soon as correlative work was attempted, it became clear that very few plantations were strictly comparable, and that with the existing material it was impossible to be quite certain how far a given effect was due to soil and how far to the various management factors. It was therefore decided to establish, if possible, a number of control plots on the main Soil Series, the varieties, stocks and management factors being as far as possible uniform. Preliminary steps have been taken in this direction.

The pomologists wish to thank the many growers visited for so readily giving them full information about their plantations.

Outside Trials.

The Stock Trial Plots at Wisborough Green and at Swanley Horticultural College have again been pruned and recorded. Trials in the control of loganberry beetle, apple blossom weevil, and woolly aphis were carried out by members of the Entomological Section on farms in different parts of the County.

Distribution of Surplus Experimental Material.

During the year, in addition to stocks distributed under the Membership Scheme and through the Horticultural Trades' Association, a large number of applications have been received from the following countries within the Empire and distributed: British Columbia, Cape Province, Cyprus, Egypt, Ireland, New South Wales, New Zealand, Ontario, Queensland and Western Australia.

Distribution of Fruit for Experimental Purposes.

During the last year we have received several requests from outside sources for fruit of correct nomenclature and of known history.

A consignment of Bramley Seedling apples in bulk were supplied to Ditton Laboratory for a cold storage experiment. Apples, pears, plums and strawberries went to Chipping Campden for canning trials; apples were sent to the Lister Institute of Preventive Medicine for experiments on the anti-scorbutic potency of apples, and the Imperial College of Science received a small consignment of apples for inoculation experiments.

A large consignment of Black Currants, including four varieties, each in three stages of ripeness, were sent to a well-known firm of jam manufacturers for jam tests.

A large amount of this fruit required careful selection, and its collection, packing and despatch involved considerable expenditure of extra time and trouble.

The box-packing of some 6,000 bushels of apples was undertaken for the Ditton Laboratory in connection with their first big experiment. This occupied the grading and packing staff for nearly three weeks.

"Journal of Pomology and Horticultural Science."

The editorial and clerical work in connection with the "Journal" has again been undertaken by the Station. Professor B. T. P. Barker of Long Ashton was identified with the work as Joint Acting Editor.

STATION'S PUBLICATIONS.

The Annual Report I—General for 1929 was published in April, 1930.

During the year 1930 twenty-five Scientific Reports and two Popular Articles for fruit growers have been issued.

The publications list has also been kept up to date.

LIBRARY.

The completion of the Empire Marketing Board building has provided the Research Station with the very much needed improved library accommodation.

It is now possible for the Staff to avail themselves of the full use, not only of the Research Station Library, but also of the Bureau Library.

The Library is used to a far greater extent than previously. It is now possible to obtain the necessary quietude and freedom from disturbance essential for reference work and study.

We would tender our grateful thanks to the donors of periodicals during the year.

ADMINISTRATIVE WORK.

The completion of the Empire Marketing Board building has greatly added to the convenience and better equipment of the Administrative Section.

The work continues to increase, especially in regard to all matters dealing with, and arising out of, the Finance. Through the three Research and Maintenance Accounts (excluding Membership and Development Endowment Fund) for the period 1st October, 1929 to 30th September, 1930 :—

	£	s.	d.
The Total Income amounted to	21,460	1	10
The Total Expenditure amounted to	21,447	11	2
The Total Capital Income amounted to ..	9,661	11	1
The Total Capital Expenditure amounted to ..	9,661	11	1

The Membership Scheme and, we also hope, the Endowment Scheme will entail during the year 1931 considerable extra work.

The clerical work connected with the distribution of stocks and especially that dealing with overseas shipments has increased.

The separate store room which was greatly needed is now in working order, and, with newly appointed members of Staff in every section, the call upon this work has increased in proportion.

The improvement in the facilities for the entertainment of visitors and Staff meals is much appreciated by the Staff, and the workers in the kitchen in the new building.

Section II

The Farm

Section II

THE FARM

By J. AMOS and A. C. PAINTER.

Seasonal Conditions.

Weather conditions during the early part of the year were ideal for all work on the farm. Whilst ground frosts were frequent, they were not at all severe, and those recorded during the blossoming season did not cause any injury. May was the most difficult month for out-door work, continued rains, whilst beneficial to plant growth, making the work of cleaning and cultivating difficult and expensive. This was particularly the case in the strawberry fields where it was necessary to clean the ground prior to "littering."

The drought that followed in June did not affect growth adversely; this was no doubt due to the benefit derived from the previous months' rain. Occasional showers during July and August caused some hindrance to soft fruit picking, and also caused much splitting of plum fruits, which encouraged the spread of Brown Rot. Owing to the glut of plums, the damage entailed no serious loss. September was also a wet month and one thing noticed in particular was the rapid spread of Brown Rot on pears long before they were ready to pick. October was ideal for the gathering of the main crop of apples which were harvested in excellent condition. Both November and December were dull, with intermittent rain which considerably hindered cultivation and all planting operations.

Good days for winter spraying were reduced to a minimum.

Marketing.

Much attention was devoted to this branch of our work, and with our increasing yields it is possible to test the relative merits of different methods of packing and grading.

Both strawberries and apples have been marketed under the National Mark Scheme and there has been every indication that the scheme is gaining favour, particularly with certain salesmen.

The value of thinned as against unthinned fruit, when marketed, has been fully tested during the past year in the case of plums, and, as is shown elsewhere, has considerably increased the net returns. Some 6,000 bushels of Bramleys

and Newtons have been graded and packed for the Ditton Laboratories, for storage experiments. This has enabled us to work up an organisation for grading and packing along commercial lines. Owing to the facilities given us by the Ditton Laboratories in the use of their Cold Store, our marketing season has been considerably extended.

Strawberry Crop.

From the appearance of the foliage and vigour of the plants during May, a heavy yield was anticipated; the quantity of blossom produced, however, was disappointing, and this fact, coupled with drought in June, made the total yield much below early expectations. The early berries were of good size and quality, but the size quickly deteriorated and the season of picking was short.

Raspberries.

The slump in prices of raspberries turned what should have been a paying crop into a loss. Owing to the experimental nature of many of our plots, the returns in many cases failed to pay the cost of picking.

Beetle was prevalent and caused considerable damage to the later picked fruit.

Currants and Gooseberries.

Red and Black Currants gave heavy yields of good quality. In the case of Black Currants, prices were so low that many consignments hardly realized sufficient to cover the cost of picking and marketing. Reds were decidedly the better proposition, especially the large-fruited varieties of the Fay type. Gooseberries were plentiful, but here again good prices were difficult to obtain.

Apples.

Despite fairly heavy yields in the previous year, most of our varieties of apples again carried heavy crops. Cox's Orange Pippin was outstanding in this respect, and the fruit was of first-class quality. Worcester Pearmain, Beauty of Bath and Gladstone were also good and among the culinary varieties, Early Victoria, Lane's and Bramley's Seedling again produced fruit good both in size and quality. In contrast to the prices for soft fruit, those obtained for the apple crops have been very satisfactory. Thinning of the fruit on practically all varieties is becoming more and more a routine operation and appears everywhere to have justified itself.

Our collection of some sixty varieties of apples including the more recent introductions yielded heavy crops and these have provided a source of interest and education to many commercial growers and other visitors.

PEARS.

Cropping of pear varieties was only moderate. Unfortunately much of the fruit deteriorated rapidly on the trees before the normal picking time owing to the attacks of tits, wasps and brown rot. Our best croppers were Conference, Souvenir de Congrès, Beurré Clairgeau, Beurré Hardy, Beurré d'Amanlis and Émile d'Heyst. The latter variety is easy to grow and its performance during the last few years makes it one of our best commercial varieties.

PLUMS.

It is probably true to say that in many plum plantations this year there were more poles than in many hop gardens. These were needed for supporting a record break-down crop of fruit of practically all varieties. This exceptional crop gave us the opportunity of testing on a commercial scale the value of thinning, the results of the work being given elsewhere. The use of a cold store for plums towards the end of the season not only eased the marketing of our crop but also enabled it to be extended over a longer period.

MORELLO CHERRIES.

These carried a satisfactory crop of good quality fruit, all of which found a ready market.

HOPS.

After slow development during May and June, rapid growth was made during July and August, which resulted in a good average crop being gathered. During September some varieties were attacked with Downy Mildew, but only a few susceptible varieties which had been left unsprayed were badly damaged by the disease. Whilst Bordeaux Mixture was not used throughout the whole garden, the varieties known to be susceptible were sprayed and the results fully justified the extra expenditure. Where sprayed, the hops remained free from disease and retained a bright colour.

PESTS AND DISEASES.

Routine winter spraying with Tar-Distillate wash was applied to most top and bush fruit. One pre-blossom spray of Lime Sulphur plus Arsenate of Lead was applied to all varieties of apples and two post-blossom sprays of Lime-Sulphur and Arsenate to all varieties except those known to be sulphur " shy." Two plots of apples, instead of receiving the wet sprays, were dusted with Sulphur and Arsenate powders for purposes of comparison.

In general, these remedial measures were very effective, our fruit being almost entirely free from blemish due to disease.

General.

Grass Plots.

One plot of ten year old Bramley's Seedling and Worcester Pearmain on various rootstocks, and another plot of sixteen year old apples under various methods of pruning was sown down to Perennial Rye grass in the spring. These plots will give an opportunity of observing the effect of grass upon rootstocks, and its effect upon trees pruned in different ways. They will also enable us to test out methods of manuring through grass. The trees on both of these grass plots can be compared with similar trees on adjacent plots growing under cultivation.

Fresh Plantings.

A final crop of wheat was taken from the land that has for the past four years been in preparation for manurial trials with apples. As this is the fourth straw crop in succession that has been taken without the assistance of manures, both the yield of straw and corn was very poor.

As soon as the wheat was harvested the land was sown to white mustard, and later ploughed and sub-soiled.

The whole area, four acres, was divided into plots, statistically arranged, and was planted up in December with two year old trees of Cox's Orange Pippin, Beauty of Bath and Duchess Favourite, all of which were raised in the Station's Nursery. The only other planting, apart from Nursery material, has been two acres of Royal Sovereign strawberries for a final test of effect of strain and time of planting.

The stool beds on Newgates produced a good crop of layered stocks and gave us a real indication of the possibilities of this method of raising fruit tree stocks on commercial lines. The demand for these stocks exceeded the supply, and this added considerably to the difficulties of allocation in regard to them.

Upper Grubb.

Upper Grubb, the land leased in 1929, was used for nursery work and the raising of strawberry runners and sets from selected clone hop varieties. Four acres on this field down to clover gave two heavy cuts of hay which was made and carted in excellent condition. A third cut was ploughed in as green manure, the land being sown later with Black Winter Oats.

Section III

Brief Progress Report of Investigations and Summaries for Fruit Growers

Part I

Pomology

Part I

POMOLOGY

A. In Relation to Tree Fruits.

(*a*) ROOTSTOCK INVESTIGATIONS.

1. Stocks for Apples.

A very comprehensive report on the rootstock trials has been published.

Two further considerable crops have since been harvested and the results indicate that the potentialities for heavy cropping exhibited by certain combinations of scion and rootstock are being maintained, whereas the bad cropping performance induced by such a stock as No. V is still obvious in all varieties which have been examined.

There are indications that the heavy cropping record of some of these trees is having a marked effect upon their vigour.

One plot containing Bramley's Seedling and Worcester Pearmain apples on representative rootstocks has been grassed down with a view to studying the effect of this treatment upon the trees.

2. Stocks for Pears.

The trials of a number of varieties of pear on quince stocks and on vegetatively raised pear stocks are being continued. In addition, several lesser-known varieties of quince are being tested as rootstocks.

3. Stocks for Plums.

Two younger experimental plots including five varieties of plum on a number of rootstocks are already showing differences in their vigour.

It is interesting to note the large differences between the same variety on, for example, two varieties of St. Julien.

While such stocks as Myrobolan B and Common Plum are, on the whole, maintaining their reputation for vigour and dwarfingness respectively, markedly different effects of the same rootstocks with different varieties are becoming apparent.

The series of trees on their own roots included in this trial bears out the theory that their vigour as compared with worked trees is largely dependent on variety.

4. Stocks for Peaches.

Sets of trained trees of one variety, Hales' Early, on various rootstocks, have been planted out against a boarded fence with a view to testing the differences in growth and fruiting.

5. Stocks for Cherries.

Sweet Cherries (*P. Avium*).

The susceptibility of sweet cherry scions worked on one particular stock to bacterial die-back has, in the past year, become very marked. Of 287 trees planted out in the winter of 1928-29, nine trees died during the succeeding summer and autumn ; six of these nine trees were worked on the stock in question, and all appeared to have died as a result of bacterial die-back. Considering that approximately equal numbers of trees on twelve or more different rootstocks were planted, this seems to be a fairly emphatic result.

The stock trial is as yet too young to have given any definite indications in other directions.

Acid Cherries (*P. cerasus*).

An obscure disease or unhealthy condition has appeared amongst the older Morello trees, and is so far confined to trees on Mahaleb stocks ; two out of eight trees on these stocks have been removed, and two others are affected. It seems likely that the vigorous early growth and satisfactory fruiting of these trees will be counterbalanced by a short life.

(*b*) ANALYSIS OF ROOTSTOCK INFLUENCE AND THE RECIPROCAL EFFECT OF SCION UPON ROOT.

A report has been issued on the analysis of a large series of trees which were lifted last winter.

Since then, records of blossoming have been obtained upon a similar series of stem and root grafted trees. In both series the precocity of trees on No. VIII as compared with such a stock as No. VI is equally obvious.

(*c*) ROOT STUDIES.

1. Excavations.

Further progress has been made with the study of mature root systems with particular reference to the effect of rootstock and soil. Two eleven-year-old Lane's Prince Albert apple trees on rootstock Nos. I and II were excavated from very heavy clay at Wisboro Green, Sussex. While the difficulty of working in this soil has limited the number of trees excavated, some definite information is now available concerning root performance in clay. This makes an interesting

comparison with the performance of similar rootstocks already excavated from sand and loam. The comparatively shallow and restricted nature of the root development in the clay is very marked.

In connection with the Kent Fruit Soil Survey (see (*h*), below), a study was made of the root systems produced under manured and unmanured conditions in an eight-year-old mixed plantation on sandy soil at Wrotham Heath. Part of the plantation had been dressed with fifty loads of farmyard manure per acre in the year of planting, and the bush and tree growth on this part were considerably greater than on the unmanured part.

A series of trees and interplanted bushes were excavated on each half of the plot, comprising in all five pear trees (Conference and Dr. Jules—three on Quince A and two on Pear stocks), ten black currant bushes (Seabrook's), and four gooseberry bushes (Whitesmith).

In these excavations a further improvement in technique was introduced by which root weights were obtained in 50 cm. squares and three vertical divisions, besides root plans from which the root-system can be reconstructed. The pear and gooseberry root-systems have been reconstructed and photographed.

The large trees on the manured plot had a much larger root-system than the small trees on the unmanured plot, but an exact comparison of root position cannot be made until the records are fully analysed. On both plots, gooseberry roots penetrated to a maximum depth of 7 ft. 9 ins., and black currants to 6 ft. The deepest pear root was more than 10 ft. 6 ins. below ground level.

2. Observation of Growing Roots.

A technique has been developed for the observation of growing roots by means of glass sided observation chambers. It has been found possible to measure the growth of roots of apple stocks along the glass side of an observation box filled with soil or sand. The development of root hairs, suberization of cortex, formation of laterals and other phenomena can also be observed and photographed, and the period and amount of growth under different conditions studied. This opens up a new line of attack on root problems and further work on these lines is in progress.

(*d*) DOUBLE WORKING. Apples and Pears.

Further interesting effects of an intermediate scion on vigour and precocity have appeared in the last year both in apples and pears. Amongst pears, the intermediate seems in some cases to have caused an "off-year," with hardly any blossom, and also to have, in one case, hastened the opening of the blossom in the spring. The fruiting of the pears has been so irregular that it is not yet possible to say whether or how far it has been affected by the intermediate. Few trees have yet borne a really heavy crop.

(*e*) PRUNING EXPERIMENTS.

1. Apples.

As a result of a severe thinning of most of the formerly " unpruned " trees, interesting results on cropping and fruit size are appearing. The bulk of unmarketable small fruit has been at once greatly reduced. It is hoped to find out how much regular pruning is needed to maintain these results.

2. Pears.

The varieties of pears which have been subjected to various degrees of pruning for the past six seasons again bore considerable crops of fruit.

The trees receiving little or no pruning have already shown a falling off in vigour and in quality of the fruit.

Differences in the susceptibility to scab between the various treatments was also observed.

(*f*) MANURING OF APPLES.

1. Potash.

Owing presumably to the somewhat heavy summer rainfall of the past year, the effect of the potash manures has been much more striking than in the drought of the previous year. There are still, however, several trees on the potash-treated plot which show severe leaf scorch.

2. General.

The trial of Bramley's Seedling and Worcester Pearmain on several root-stocks, in which a comparison has been made between balanced manuring and complete starvation has been continued for another year, and a report has been issued. During the next season, attempts will be made to remedy the deficiency on the starved plot by application of nitrogen and potash, separately and in combination.

A large-scale manurial trial is being planted this autumn in which nitrogen, potash and phosphates in all possible combinations will be applied to plots containing Cox's Orange Pippin and Beauty of Bath on representative rootstocks.

(*g*) FRUIT BREEDING.

1. Rootstocks.

The work of raising new varieties of apple rootstocks, in collaboration with the John Innes Horticultural Institution, has been proceeded with. A large number of seedlings, the progeny of crosses between the Malling series of Paradise apple rootstocks have been planted out for a preliminary nursery trial. Further crosses between the chief Paradise rootstocks and Northern Spy have been made

during the past year and the material will be handed over to the Entomological section for infection tests in due course.

2. Scion Varieties.

Further crosses have been made with the object of raising new varieties of apples of good quality and high colour. A number of seedlings, raised in 1929, have been worked on dwarfing and vigorous rootstocks, and will be planted out to afford further preliminary evidence of the influence of rootstocks in hastening the blossoming of seedling apples. At the same time, preparations for a larger and more definite trial are going forward.

A number of crosses between varieties of pears have been made with the object of obtaining varieties of high quality and extended season.

3. Small Fruits.

A large number of seedlings from first crosses between the main varieties of black currants have been raised during the past season. These are required to supplement information already obtained as to the inheritance of characters. A paper dealing with the breeding behaviour of selfed families of the main varieties of black currants has now been published. As further data becomes available, a second part of this paper will be published. Seedlings from a number of crosses between black currant varieties and nearly related Ribes species have been raised.

The raising of material to provide an insight into the genetic constitution and inter-relationship of the chief red currant varieties is being continued.

(*h*) FRUIT SOIL SURVEY OF LOWER GREENSAND IN KENT.

During the second year of the Survey pomological records have been taken as far as possible on the farm-to-farm method, from West Peckham to Crockham Hill on the Hythe Beds, and thence returning eastwards on the Folkestone Sand from Sevenoaks to Bearsted. The fruit holdings in these districts are smaller and more scattered than in the area between Sutton Valence and West Peckham.

The soil chemist working at the S.E.A. College, Wye, has continued the identification and location of the different soil series occurring within the area of the survey.

Correlative work has shown that while it is possible to describe the soil conditions which are usually detrimental to good tree performance, the influence of good or bad management may often mask the effect of variation in soil.

A remarkable case of difference in growth in a plantation of pears and bush fruit, said to be entirely due to manuring in the year of planting, was investigated by excavating the root systems of trees and bushes on the manured and unmanured parts of the field. (See Root Studies (*c*) 1.)

(*j*) WALNUTS.

Experiments in various indoor and outdoor methods of propagation have been continued and an article on the propagation of Walnuts was published in the Journal of the Royal Horticultural Society, Vol. LV, Part 2.

An exhibit dealing with the propagation of walnuts was staged at the Walnut Competition held in the Royal Horticultural Society's Hall in November, 1929. The possibility of multiplication by vegetative methods of outstandingly valuable walnut trees for timber is being explored.

(*k*) PYRETHRUM.

A number of clone selections were grown and their flowers, after being dried, were sent to Harpenden to be tested for their comparative toxic value. Three out of the seven proved superior to the remainder. These trials are being continued.

B. In Relation to Bush Fruits.

(*a*) CURRANTS.

The Variety Trials.

The first full crop from the variety trial carried out in collaboration with the Royal Horticultural Society has been harvested this year.

The heavy cropping potentialities of Baldwin on this soil is again demonstrated. While Davison's Eight has produced a fair crop, the cropping of Boskoop and Taylor's has been very much poorer.

Certain Seedlings raised at this station are also being tested and, in two cases, crops equal to that of Baldwin have been obtained.

A further planting of Red Currants raised from clone material has been planted, in order to test the cropping capabilities of the main commercial varieties.

(*b*) RASPBERRIES.

Four years' cropping records of the variety trial plot have given useful results, although certain varieties have been considerably affected by disease and other troubles. The cropping of some varieties has pretty certainly been reduced by mosaic disease, and probably in some cases by other diseases, whilst some varieties, which seem always to show symptoms of mosaic disease wherever they are grown, have nevertheless cropped well. There appear also to be significant differences in the cropping of those varieties which have hardly been affected by diseases.

Brief notes on the leading varieties appear on a later page of this report, and a more detailed account in Part II (Supplement).

Preparations for a further cropping trial are well under way, the material to consist of those varieties which are still obtainable free from mosaic disease. Some thirty varieties are now being propagated for this purpose.

A system has now been devised whereby varieties newly collected for trial are in the first instance planted out on a " quarantine plot " in a remote part of the Station Plantation. On this plot they are observed from a pathological point of view for a year and preliminary roguing of " mosaic stools " is carried out. At the end of the year selected cane is planted out on a special propagation plot and a stock of mosaic-free cane is raised for use in the trials. Further details of this plot will be found under the heading " Raspberry Mosaic " on page 88 of this report.

Manurial Trials on Lloyd George and Pyne's Royal raspberries have been continued for a further season. The former trial is proving very accurate in spite of a marked soil variation, and interesting indications are beginning to appear both in the cropping and in the growth of new cane.

The Pyne's Royal have proved exceedingly variable, the growth of cane being very irregular and many stools have died out altogether. In spite of this, indications of a response to manuring are beginning to appear, and the trial will be continued for a further season.

(*c*) Strawberries.

Strain.

Another year's work has confirmed the impression that, in our experiments, difference in " strain " is mainly a question of vigour of plant, depending not on the clone but on the environment of the plant.

Selection of Runners.

As in the question of strain, preliminary experiments show that vigour of runner is more important than selection from fruiting parents.

Time of Planting.

Three years' experiments confirm empirical findings as to the desirability of planting as early in the season as moisture conditions of the ground allow, provided there is a reasonable expectation of rain to follow. Under our conditions, August planting has not been successful.

De-blossoming.

An experiment now in progress has shown that the blossoming of strawberry plants greatly increases the runner production, and slightly increases the size of the de-blossomed plant. No figures are yet available as to the effects of de-blossoming on fruit production.

Varieties and Rogue Plants.

A collection of some twenty of the main strawberry varieties has been established. A number of " Rogue Plants " found in commercial stocks have been collected and planted up for observation and description.

(*d*) Root Studies.

The excavation of some black currant and gooseberry root-systems is reported under I A (*c*) 1 above.

Statistics and Records.

The appointment of an assistant in the Statistical Section has made it possible to complete the summaries of back records.

The labour-saving devices which have been adopted have proved, in the main, satisfactory, and have considerably lessened the labour of recording. A technique for sampling the blossom production of a tree has been successfully tried out.

The experiences in the art of planning and recording horticultural field experiments have led to the publication of two reports; and an extensive memorandum, to be published by the Imperial Bureau of Fruit Production, is nearing completion.

The great accuracy attained by applying modern methods of plot arrangement to standardized horticultural material is becoming yearly more apparent.

PUBLICATIONS DURING THE YEAR.

Hoblyn, T.N. THE RELATIONSHIP BETWEEN THE EXPERIMENTAL AND THE DEMONSTRATION PLOT AND THEIR RELATIVE VALUE TO THE INVESTIGATOR, THE COUNTY OFFICER AND THE FRUIT GROWER. East Malling Res. Sta. Ann. Rep. for 1929 (April, 1930.) (I—General).

Summary.

(1) The variations to be found in horticultural crops and their effects upon modern methods of field experimentation are described.

(2) It is affirmed that Extension Trials or " Tests " carried out outside the regular research stations are an essential part of horticultural research.

(3) The difference between the demonstration plot and the experiment or test is defined.

(4) Some not very complicated arrangements of plots, suitable for such tests, are described.

(5) It is pointed out that the fruit grower cannot be expected to carry out experiments, but that demonstrations on his own farm will be of great assistance to him in obtaining the maximum benefit from the results of recent research.

Tydeman, H. M. SOME RESULTS OF EXPERIMENTS IN BREEDING BLACK CURRANTS. I.—THE SELF POLLINATED FAMILIES. Journ. of Pom. and Hort. Sci. (May, 1930). **8.** 106-128.

SUMMARY.

(1) Details of observations extending over seven years, made upon seedlings of selfed families of the first and second generations of the chief varieties of black currants are summarised and discussed.

(2) The behaviour of the seedlings with respect to the colour and form of the buds, season of leaf break and fruit maturity, length of the fruiting racemes, size and flavour of the fruits and texture of the fruit skin is dealt with. It is shown that the characters which were studied were transmitted without material modification to seedlings of the first and second generations.

(3) It was found that, whereas Boskoop Giant, Goliath and Baldwin, when selfed, produced seedlings which bore leaves in all essential respects similar to those of the parent varieties, French Black and four closely allied varieties, produced, in addition to seedlings bearing leaves like the parent, a number which bore leaves of an abnormal shape. Seabrook's Black and Siberian, when selfed, gave rise to seedlings bearing two additional types of abnormal leaves as well as to bushes similar to those noted for French Black and bushes with leaves like those of the parent.

(4) It is shown that none of these seedlings, with the possible exception of a small class segregating from varieties of the French group, gave rise to any new characters or combination of characters, of marked economic value.

Hatton, R. G. THE DEVELOPMENT OF A RESEARCH PROGRAMME AROUND THE "BUILD UP" OF A FRUIT PLANT. Report and Proceedings of the Ninth International Horticultural Congress (August, 1930). 245-251.

SUMMARY.

In attempting to apply the exact methods of the laboratory worker to field investigation, the initial difficulty faced was the variability of our experimental material.

The individual and varietal differences which it exhibited, such as vigour, productiveness, disease resistance, etc., all genetic characters, could only be

perpetuated with certainty by the re-establishment of pure lines of plants from a single type parent, whose botanical, pomological, pathological (and sometimes even genetic) " build-up " was previously intimately studied. This was accomplished by the only practical method at present available—an extended use of methods of vegetative propagation.

The problem was even more complicated in the case of grafted (or budded) plants in which the interaction of unknown stocks with endless varieties of scion resulted in a variability in behaviour exceeding that induced by the differential treatments which it was designed to compare. Hence an intimate study of the " build-up " of the tree—rootstock and scion—was considered an essential preliminary to the development of investigations in the field.

Comparatively small differences in such things as response to manurial treatments and in degrees of disease resistance, which previously have not become evident with the use of heterogeneous material, have already been detected by the use of standardised material.

Amos, J., Hatton, R. G. and *Hoblyn, T. N.* THE RESPONSE OF APPLE TREES ON KNOWN ROOT-STOCKS TO APPLICATIONS OF A COMPLETE FERTILIZER. Annals of Applied Biology. (August, 1930). **17.** 657-674.

SUMMARY.

(1) A simple experiment, wherein a plot of apple trees receiving applications of a balanced manure has been compared with a similar plot which has received nothing but applications of non-leguminous green crops, has now been conducted for eleven seasons.

(2) On land which was in " good heart " at the time of planting the trees showed no response to manuring during their first six years' growth.

(3) From the seventh year onwards to the present date, very definite differences began to appear between the two plots in vigour, cropping, size and quality of fruit and health of the trees.

(4) Of the varieties used, Bramley's Seedling has suffered from the starved conditions to a greater degree than Worcester Pearmain.

(5) The same variety budded upon different rootstocks shows a marked differential response ; trees on rootstocks in the " semi-dwarfing " group have suffered earlier and more markedly than those on the vigorous group of rootstocks.

(6) It is also demonstrated that a rootstock inducing really bad performance, such as the poor crops and small fruits produced by trees on Doucin Ameliore (No. V.), still gives bad trees, even when subjected to balanced manuring.

Grubb, N. H. THE REACTION TO POTASH FERTILISERS OF APPLE TREES IN THE FIELD. Annals of Applied Biology. (August, 1930). **17.** 674-681.

SUMMARY.

The application of sulphate of potash over a period of years to part of the "Apple Pruning Plot" at East Malling has resulted in :

(1) A great reduction of "leaf scorch."

(2) Greatly increased growth of the trees.

(3) A great increase in weight of crop and size of fruit.

(4) In some cases better "setting" of the blossom.

(5) In a few cases a probable reduction of blossom bud formation.

(6) Heightened fruit colour, except where increased foliage shades the fruit.

(7) No reduction of disease, except probably apple mildew (and "leaf scorch").

(8) In one or two cases, foliage more resistant to "spray injury."

Amos, J., Hatton, R. G., Hoblyn, T. N. and *Knight, R. C.* THE EFFECT OF SCION ON ROOT. II.—STEM-WORKED APPLES. Journ. of Pom. and Hort. Sci. (August, 1930). **8.** 248-258.

SUMMARY.

An extension of previous experiments which has involved the morphological analysis of various combinations (stem-worked) of six commercial scion varieties and four rootstocks has revealed the following features :—

(1) In the maiden year the total weight of roots was characteristic of the stock rather than of the scion, although subsequently the effect of scion on the total size of the root system may be more marked. Grenadier at two years' old, for example, induces the formation of a larger root system than other varieties compared with it, and incidentally shows a relatively high ratio of root to shoot.

(2) Other factors being equal, a large root system has a lower percentage of fibrous roots than a small one.

(3) Consequently the use of different scions may indirectly affect the percentage of fibre on the root by altering the size of the whole system.

(4) The differences thus produced are small in comparison with the differences between the root-systems when unworked, and therefore the latter still unmistakably exhibit their distinctive varietal characters irrespective of the influence of the scion variety.

(5) Thus the well marked qualitative differences between the rootstocks are still present in stem-worked trees and are not obscured by scion influence.

Hoblyn, T. N. FIELD EXPERIMENTS : THE ADAPTATION OF MODERN STATISTICAL METHODS TO HORTICULTURAL CONDITIONS. Proceedings of the Imperial Horticultural Conference, Part II. (August, 1930). 5-19.

SUMMARY.

The comparative failure of the older methods of field experimentation is shown to have been due in the first place to the very variable material employed. Secondly, sufficient attention has not been paid to other causes of variation, such, for instance, as soil heterogeniety. Improvements in material, technique and plot arrangement are described and an example is given of the lay-out of a modern manurial trial of apple trees.

Hatton, R. G. THE RELATIONSHIP BETWEEN SCION AND ROOTSTOCK WITH SPECIAL REFERENCE TO THE TREE FRUITS. Part I. and II. Journ. of Royal Hort. Soc. (September, 1930). **55.** 169-211.

SUMMARY.

The behaviour of fruit trees on their own roots and the practice of working them in preference upon rootstocks are discussed.

The method of grafting on to the stock stem is contrasted with whole and piece root grafting. Scion rooting is often intentionally encouraged in the latter. Instances of variability of trees on seedling rootstocks and other causes of variability are cited. Trees on clonal layered stocks are compared. The possibilities of eliminating incompatibilities thereby are suggested. Attempts to obtain true lines from seed are quoted. A wider use of vegetatively propagated rootstocks is suggested. Causes of variability within the clone are discussed.

Evidence in favour of scion selection and bud variation is considered.

Experiments proving effect of rootstock upon scion are summarized. Numerical data are given illustrating special scion potentialities, stock peculiarities, modifications due to soil and subsoil type, and cultural treatments, such as manuring.

The less measurable but marked characteristics conveyed by rootstock to scion are emphasized, and shown to increase with age of trees.

Attempts to elucidate the cause of stock influence are reviewed. The effect of an intermediate scion is discussed in relation thereto. This appears to increase with the length of the intermediate.

The reciprocal effect of the scion upon the rootstock is considered and figures presented showing the minor modifications caused by the use of different scions worked upon the stems of layered rootstocks.

Witt, A. W. FURTHER NOTES ON WALNUT GROWING IN ENGLAND. Journ. of Royal Hort. Soc. (September, 1930). **55.** 257-265.

SUMMARY.

Methods of propagation from seed and by vegetative means are described in detail with indications of the measure of success obtained in rooting different species of Juglans by layering.

Methods of budding and grafting are described and the importance of proper selection of scion material is stressed.

Observations on pollination and susceptibility of different varieties to frost injury are recorded.

The possibility of multiplication by vegetative methods of outstandingly valuable Walnut trees for timber, is being explored.

THE HEAVIEST CROPPING RASPBERRY VARIETIES AT EAST MALLING.

By N. H. GRUBB.

The fruit yield of a number of raspberry varieties during the seven seasons 1919 to 1925 was reported in 1926.* A more carefully planned trial was planted early in 1926, and has now yielded four crops of fruit. Some notes on a few of the leading varieties may be of interest to growers. A more detailed account appears in the Supplement (Part II) to this Annual Report.

It must be realized that the results of trials in any one soil are not an infallible guide to the behaviour of varieties in other soils and conditions. Experience shows that certain varieties of raspberry, such as Baumforth A, Lloyd George and Red Cross, grow and crop well in a great variety of soils. Others, such as Pyne's Royal, seem to be partial to certain soils, and would probably in many cases give relatively heavier or lighter crops than those obtained here. It should be remembered also that several promising new varieties were not available for planting in this trial; these include Norfolk Giant, Preussen, Burnet Holm Seedling, Brockett Hall, Matchless, Duke of Cornwall and several others. It is intended to plant a further trial as soon as canes of these are available in sufficient quantity.

Out of twenty varieties in the current trial, the following seven have yielded the heaviest crops. They are mentioned in the actual order of their cropping:

Baumforth A has given an average crop for four years of just two tons per acre. If the first year of cropping (1927) is omitted, the average is slightly over two and a half tons per acre. In our soil the plants grow very vigorously and are as a rule exceptionally healthy; the variety is known to succeed in a great variety of soils and conditions. The fruit is often large, round, rather soft, of fairly good colour, and very acid, suitable only for jam and cooking, for which purposes it is one of the best. Raspberry growers who produce fruit mainly for jam makers might well try this old variety. It is quite distinct from the more commonly grown Baumforth B, a variety with firm, sweet fruit.

Helston, a Cornish variety, is of more doubtful value. It is known to crop heavily in widely different conditions, but the fruit is seldom of more than fair size, and often small, and is usually dull coloured. Its heavy cropping and comparative freedom from disease will hardly make up for its poor fruit quality.

* "Raspberry Varieties and their Cropping." *Journ. of Pom. & Hort. Science*, Vol. **V.** No. 2, March, 1926.

LLOYD GEORGE is probably the best all round variety at present available for planting on a large scale. Nevertheless, it has certain faults. It is somewhat susceptible to mosaic disease, which is apt to reduce its crop considerably. It is also susceptible, in damp soils and in certain seasonal conditions, to a rotting of the roots and underground stems, which may result in the death of a large proportion of the canes in the spring. It usually makes too many canes both in and between the rows, with the result that the fruiting laterals are often badly shaded. The fruit, while very large on young plants, is usually much smaller as the plants get older ; on plants more than five or six years old, only a small proportion is usually large enough for punnetting. Finally, the fruit, while of fairly good colour, tends to turn rather dark when over-ripe, making it desirable to pick more frequently than is usually convenient.

RED ANTWERP C is very little behind Lloyd George and Helston in average crop for four years ; the three year average (with the first year of cropping omitted) puts it slightly above Lloyd George, but below Helston, at nearly 46 cwts. per acre. This old variety could not be described as " large fruited," but its fruit is larger and better coloured than that of Helston, and, while rather acid, is passable for dessert. The plants are somewhat susceptible to mosaic disease and considerably dwarfed by it. The variety would hardly be worth planting unless a healthy stock could be obtained.

NORTH WARD, another Cornish variety, appears here to be susceptible to drought injury. At its best, it is very fine, producing fruit almost as large as that of young plants of Lloyd George, and somewhat better coloured and better flavoured. With the exception of a few plants slightly affected by mosaic disease, our stock has remained generally healthy. The canes are taller and less numerous than those of Lloyd George. The variety should be valuable for soils which are not apt to dry out badly.

RED CROSS comes lower in the cropping table than was expected, owing to weak growth and the death of many canes, from an unknown cause, in 1927 and 1928, which greatly reduced the crops of 1928 and 1929. The plants have now recovered, and are more vigorous than ever before. It has so far been impossible to find a plant free from mosaic disease, but the growth and cropping do not seem to be affected by it. On this account it is inadvisable to plant this variety close to healthy stocks of Lloyd George or other varieties susceptible to mosaic injury. The fruit is large to very large, fairly bright coloured and suitable for dessert. It has been once reported as of poor quality for jam making.

PYNE'S ROYAL usually produces fruit of greater average size than any other variety, except perhaps young plants of Lloyd George. Where the growing conditions are reasonably good, very little of the fruit is too small for punnetting. The fruit turns dark coloured when over ripe, making frequent picking desirable.

The plants have the fault in most soils of making too few canes ; where the canes are numerous, the cropping should be relatively heavier than it has been here. Every plant apparently shows slight symptoms of mosaic disease, but the growth and cropping do not seem to be seriously affected.

A further result of this trial is worth a brief mention.

In the trial are included four stocks of Hornet A, and three of Black Antwerp A, each from a different source. The differences in cropping of these different stocks of the same variety have been generally consistent from year to year, and roughly the same as those reported in 1926. The heavier cropping stocks seem in each case to have made the best growth ; the crop is, in fact, largely a reflection of the number and length of the canes in the row. There is nothing to show in this case that the heavier cropping stocks have been freer from disease. Whilst the differences are not generally " significant," in the statistical sense, the fact that they have been repeated in two trials is suggestive.

Growers who are buying raspberry canes for planting would be well advised, wherever possible, to make sure that the plantation from which the canes come is not only reasonably healthy, but also vigorous. It would probably even be worth while to see the plants growing in the summer before planting, at least wherever the plantation is within easy reach.

THREE "ROGUE" VARIETIES OF BLACK CURRANTS.

By J. AMOS.

Whilst it is probably true that most varieties of black currants planted in recent years have been both true to name and of some commercial value, there are still in circulation certain worthless rogues which either set no fruit at all or, at the best, yield very small crops. In recent years three such rogue varieties have been received both from nurserymen and from growers' plantations under the name of Baldwin Black, normally a widely-grown and heavy-cropping variety.

Frequently it has been possible to trace back the history of the rogue variety in cases where cuttings or bushes have been passed on in all good faith from the grower's plantation to another. Cuttings being usually taken from the newly-planted bushes, either for home use or for distribution, the acreage of these rogue varieties may multiply rapidly.

It may be asked how it comes about that such worthless rogues continue to be propagated.

There are probably two reasons for this: first, because the raiser fails to recognise the variety as a rogue and continues to propagate it under the impression that it is a true Baldwin, or some other commercial variety, and secondly because the grower, where crops fail, attributes their failure to some adverse condition such as frost, instead of recognising the failure as being due to some cause inherent in the rogue variety.

This non-setting of the fruit in successive years which, as will be seen later, is one of the chief characteristics of the three rogues to be described, usually ends in the grubbing of the bushes concerned, but only after the loss of much time and money. In the meanwhile, the stock from such bushes may become widely distributed, in quite good faith, but with disastrous consequences.

In order to ascertain whether these rogue varieties comprise one or more types, collections have been obtained from various sources during the past few years for the purpose of studying their botanical characters with a view to their future identification. One point of interest is the purity of the stocks of these rogue varieties. In no case was it found that two rogue varieties were mixed. In the three cases in which mixtures did occur, the admixtures were the well-known standard varieties, French, Boskoop and Goliath respectively. In all, some twenty collections have been examined and it has been found that these consist of only three distinct botanical types. The origin of these types is uncertain, but there is good reason to believe that they came originally from the Continent.

So far as our experience goes these types have been substituted only for the variety Baldwin, hence the reason for comparing them with this variety. They have been grown in rows adjacent to Baldwins so that a detailed study could be made of their botanical characters and cropping capabilities when grown under identical conditions.

This paper gives detailed descriptions of the types isolated, together with that of Baldwin, as an aid to their identification.

Owing to the lack of knowledge as to the origin of these rogue types they will for convenience be referred to as A, B and C. Whilst these types bear some superficial resemblance to the true Baldwin the differences between them, when a detailed comparison is made, are seen to be very distinct.

The table* gives their descriptions, and the outstanding differences when compared with Baldwin are given in italics. Winter and summer descriptions are separated so as to aid identification during either season.

General Characters.

True Baldwin.

The bushes of this variety are much weaker in growth than the rogue varieties. The buds are longer, more conical and the bud scales much more loosely arranged ; they are also more protruding. The racemes are of medium length and on the whole shorter than those of the rogue types. The flowers are also less coloured. The stigmas are generally on a level with the anthers and in this respect differ widely from the rogue types in which the styles are very long so that the stigmas are well above the anthers. The leaves are regular in shape ; the central lobe is long and acute, the lateral lobes short but acute. The leaf sinus is deep. The lamina is dark green in colour. The fruit is of medium size and almost invariably sets well. It is the earliest to come into leaf and flower but the fruit hangs late.

Rogue Type A. (*Received from ten sources.*)

The bushes are very vigorous, large, compact and much branched. The buds are oval and greenish, the bud scales very compact and less protruding than in the Baldwin. The racemes are medium in length to long, waved, horizontal. The flowers are pinkish in colour. The styles are long and the stigmas much above the anthers. The leaves are regular, the central lobe short, pointed and very broad. The lateral lobes are very short, obtuse and often rounded. The lamina is often cupped. The leaf sinus is deep and the lobes often overlap. The lamina is dull green, often with yellow mottling. The fruit is small and acid, the skin hard and tough. It is a midseason variety and very few flowers set.

* Pages 59 and 60

Rogue Type B. (*Received from eight sources.*)

The bushes are very vigorous, compact, and much branched. The wood is much stouter than either Baldwin or Type A and is darker in colour. The buds are brownish red, very round and plump, the scales chaffy and loose, and protrude but slightly. The racemes are long, rigid, horizontal, flowers pinkish, stigmas much above the anthers. The leaves are very rugose, folded along the lobes, central lobe long, broad often recurved, lateral lobes long and acute, margins coarsely serrated, often waved. Leaf sinus and lobe sinus are deep. The foliage is bright green. The fruit is midseason, small, acid, the skin tough. Very few flowers set.

Rogue Type C. (*Received from two sources.*)

The bushes are very vigorous, erect when young, later very spreading, much branched. The buds are medium to small, conical, greenish and ragged, pointed, stalked and erect. The racemes are of medium length and horizontal. The flowers are pale yellow in colour, the stigmas much above the anthers. The leaves are thin and flattish ; the central lobe is broad but acute, the lateral lobes are irregular and often obtuse. The leaf sinus is intermediate to shallow, the petiole green. Fruit medium in size, rather mild, midseason, skin tough. It yields a very small crop.

CROPPING.

The almost total failure of the rogue types to set fruit has already been referred to, and the following table gives an idea of their respective performances when grown under the same conditions as Baldwin.

Average Weight of Fruit per Bush, 1929. (*Five years planted.*)

Baldwin	(10 bushes)	..	64 ozs.
Rogue Type A	(10 ,,)	..	7 ,,
,, ,, B	(10 ,,)	..	4 ,,
,, ,, C	(2 ,,)	..	20 ,,

The yields of the rogue types, all of which produce large vigorous bushes, are shown to be very low when compared with the Baldwin which makes a much smaller bush. The cause of the failure of the flowers to set a crop is at present not clear but as they all possess long styles, bringing the stigmas above the anthers it is probable that lack of pollination (2) is a contributory factor. If this is so pollination of the flowers by hand should remedy the defect, but preliminary trials in this respect have not been successful. Further trials will be made another season and the possibility of internal defects in flower structure will also be investigated in order to find out the underlying cause of the failure to set fruit.

Summary.

1. The practical importance of planting varieties of Black Currants true to name is emphasized.

2. The performance of certain varieties distributed as Baldwin are compared with that variety, and they are shown to be worthless.

3. Detailed descriptions are given, together with that of Baldwin, as an aid to their identification.

References.

(1) *Hatton, R. G.* Black Currant Varieties—A Method of Classification. Journ. Pom. & Hort. Sci., 1920, **1.** 145-154.

(2) *Wellington, R., Hatton, R. G.,* and *Amos, J.* The Running Off of Black Currants. Journ. Pom. & Hort. Sci., 1921, **2.** 160-198.

Type:	Baldwin's Black.	Rogue Variety A.	Rogue Variety B.	Rogue Variety C.
WINTER CHARACTERS.				
Habit of Growth.	*Dwarf compact bush.*	*Large compact bush.*	*Large compact bush.*	*Very large bush, very spreading.*
Strength of Wood.	Weak.	Weak.	Strong.	Weak, slender.
Wood Colour.	Light buff.	Light buff.	Bright buff.	Pale buff.
Buds.				
Size.	Long and large in relation to stoutness of wood.	*Medium.*	*Large and prominent.*	*Small, often crowded.*
Shape.	Conical.	*Oval.*	*Round and broad.*	*Conical (narrow).*
Apex.	Often pointed.	Acute.	Obtuse.	Very pointed.
Colour.	Light green appearing almost white.	*Dull green slight reddish tinge.*	*Brownish red.*	*Light green, tinged pink.*
Scales.	Loose and ragged.	*Compact.*	*Loosely arranged.*	*Ragged at apex.*
Position.	Very protruding.	Protruding.	Protruding.	*Erect, stalked.*
Season of coming into leaf.	Quite the earliest in leaf.	Early, a little later than Baldwin.	Early, later than A.	Early, but much after Baldwin.
SUMMER CHARACTERS.				
Inflorescence.				
Number of Racemes at node.	Usually two to three.	Usually two.	Usually one.	Usually one.
Length of Peduncle.	Medium.	Medium.	Long.	Rather short.
Pose of Peduncle.	Semi-rigid and wavy.	*Horizontal, wavy.*	*Horizontal.*	*Horizontal.*
Peduncle.	Short, curved towards base.	Long, curved towards base.	Long, not curved.	Long, curved towards base.
Bracts.	Minute, broad at base.	Small.	Small.	Small.
Flowers.				
Number.	Six to twelve.	Seven to ten.	Ten to twelve.	Seven to nine.
Size.	Medium.	Medium.	Medium.	Medium.
Calyx Tube.	Very light yellow green.	Yellow-green.	Yellow green.	*Pale, yellowish.*
Sepals.	Slightly flushed pink.	Tinged pink.	Tinged pink.	Tinged pink.
Petals	Light yellow green.	Light yellow-green.	Light yellow-green.	Light yellow-green.
Style	Stigmas usually on level. with anthers.	*Stigmas much above anthers.*	*Stigmas much above anthers.*	*Stigmas much above anthers.*

Type :	Baldwin's Black.	Rogue Variety A.	Rogue Variety B.	Rogue Variety C.
Leaf.				
Size.	Medium to small.	Medium to large.	Medium to large.	Medium to small.
Surface.	Flattish, slightly. rugose, dark green.	*Flat, rugose edges upturned, often cupped, dull green mottled with yellow.*	*Flattish rugose much raised between veins, latter recurved, bright green.*	*Flat, slightly rugose, thin, in texture, light green.*
Terminal Lobes.	Acute pointed, appearing long owing to short lateral lobes.	*Sub-acute, very broad and short.*	*Long, broad and acute, recurved.*	*Acute, curving downwards.*
Lateral Lobes	Very regular and acute.	*Irregular, short and obtuse often rounded.*	*Regular, medium broad, acute, recurved.*	*Regular, short and acute.*
Serrations.	Noticeably regular and acute.	*Irregular, very coarse, often rounded.*	*Regular, coarsely serrated margins often waved.*	*Irregular, often obtuse.*
Petiole.	Medium to long, pinkish.	Medium, deep red.	Medium to long, pinkish.	*Short, pale green.*
Leaf Sinus.	Usually deep.	Deep, often closed by lobes.	Deep.	Intermediate to shallow.
Lobe Sinus.	Deep.	Intermediate to shallow and very wide open.	Very deep.	Intermediate.
Angle of Petiole.	Twisted.	*At right angles to branch.*	*Twisted, gradual obtuse bend.*	*Curved towards stem.*
Fruit.				
Size.	Good medium size.	Small to medium.	Small.	Medium.
Trusses.	Medium.	Medium.	Long.	Medium to short.
Setting.	Very little " running off."	Almost complete failure. to set.	Almost complete failure to set.	Sets a very small crop.
Season.	Late to ripen, hangs late.	Midseason.	Midseason.	Mid season.
Skin.	Very tough.	Very hard and tough.	Very hard and tough.	Very hard and tough.
Flavour.	Somewhat acid.	Very acid.	Very acid.	Somewhat acid.

Baldwin. "Rogue," Type A. "Rogue," Type B. "Rogue," Type C.

Winter Shoots, showing bud characters.

Baldwin.

"Rogue," Type A.

Foliage Characters.

"Rogue," Type B.

"Rogue," Type C.

Foliage Characters.

STRAWBERRIES AT EAST MALLING.

EXPERIMENTS IN STRAIN, TIME OF PLANTING, AND DE-BLOSSOMING.

By W. S. ROGERS.

A DETAILED report of experiments to test the effect of Strain, Time of Planting, and De-blossoming of Strawberries is appearing in our *Annual Report, Part II* (*Supplement*). There the modern experimental technique is described, and the experimental error and significance of differences is discussed.

This paper gives a review of the main points in the work which seem to be of practical importance to the grower.

(1) STRAIN.

Strains A, B and C of Royal Sovereign strawberry bought from three different sources, showed considerable differences in vigour, health and cropping in the first generation (see Table I). These plants were drastically rogued, and carefully selected runners were used to plant a second generation, which gave very much more uniform results (see Table II). It will be seen that Strain B, first generation was worse than A and C in its second crop. In the same season the selected second generation of B was slightly better than A or C. The percentage of Red Plant was also considerably reduced in the second generation, being then only about 0.25 per cent. A third generation was planted with further selected runners, the first year's records of which appear in Table III. In this third trial two new selections were included, namely runners from definitely fruiting one-year old plants of Strain A, called Af, and runners from plants which definitely bore no fruit, called Anf. Table III shows that the difference between the crop of the third generation of the three strains A, B and C, and also the difference between Af and Anf was small, and less than the chance errors of the experiment. Both Af and Anf bore less than A, and this was probably because they were smaller runners in the first place. The runners from the non-fruiting parents definitely did fruit, so it was not a question of heriditary sterility in this case. Most of the non-fruiting parents fruited in the second year.

These results suggest that a good stock can in time be built up by " roguing " and selection, from less valuable stock. But where a grower does not want to spend time and trouble in building up his strain, it is better to get a carefully selected stock in the first place.

TABLE I.

Strawberry Strain Trial 1. *First Generation. Vigour, Health and Cropping.*

	Strain A.	Strain B.	Strain C.	Standard Error.	Significant* Difference.
Percentage of vigorous healthy plants. July, 1928	**62.4**	**62.1**	**71.6**	**2.3**	**6.8**
Percentage of Red Plants. May ..	**7.1**	**8.5**	**3.4**	**0.4**	**1.2**
Do. July ..	**5.1**	**6.1**	**2.2**	**0.4**	**1.2**
Crop 1929, cwt. per acre	**12.9**	**10.8**	**13.2**	**0.6**	**1.8**
†As Percentage of general mean ..	105	88	107	4.8	14.2

Each figure is the average of twelve plots (of 684 plants), six planted in October, 1927, and six in February, 1928.

* This column gives the variation possibly due to chance.

† Percentage of general mean. This gives the results as percentages, taking the "general mean," *i.e.*, the average of all the plots in the experiment, as 100.

TABLE II.

Strawberry Strain Trial 2. *Second Generation. Vigour and Cropping.*

	Strain A.	Strain B.	Strain C.	Standard Error.	Significant Difference.
Crop in first year, 1929. Cwt. per acre	**2.18**	**2.30**	**2.19**	**0.12**	**0.33**
As percentage of general mean ..	98.0	103.7	98.5	5.3	15.0
Average diameter of plant, August, 1929	**22 cm.**	**23 cm.**	**22 cm.**	**0.03**	**0.08**
Percentage of general mean ..	98	104	98	1.2	3.5
Percentage of total plants alive ..	**81**	**80**	**83**	**1.1**	**3.3**
Crop in second year, 1930. Cwt. per acre	**22.0**	**19.9**	**21.7**	**0.8**	**2.2**
Percentage of general mean ..	104	94	102	3.6	10.4
Average diameter of plant, Sept., 1930 (eight plots of each) ..	**26 cm.**	**27 cm.**	**29 cm.**	**0.15**	**0.47**
Percentage of general mean ..	95	99	105	5.6	17.4

Each figure is the average of sixteen plots, four planted in October and December, 1928, and March and April, 1929, respectively.

TABLE III.

Strawberry Strain Trial 3. *Cropping.*

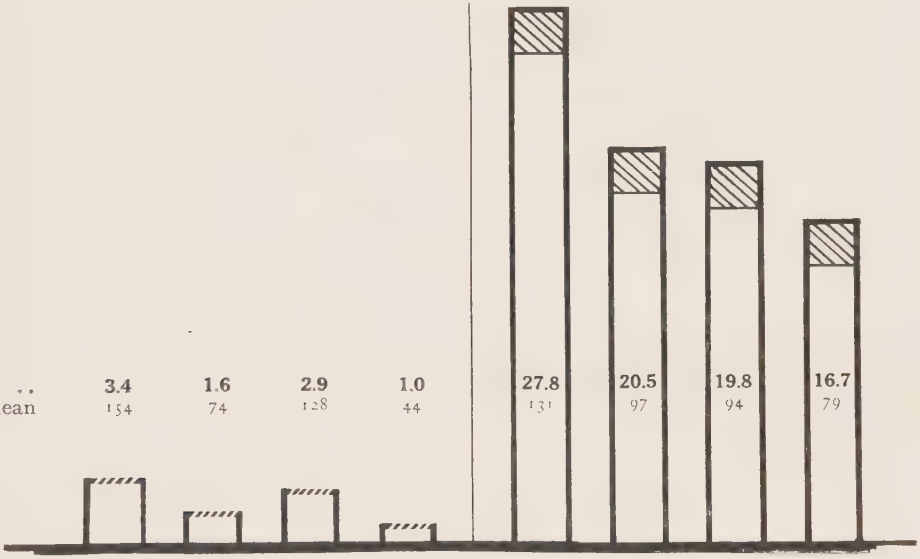
	A.	B.	C.	Af.	Anf.	SE.	Significant Difference.
First year's crop, 1930. Cwts. per acre ..	**6.1**	**6.3**	**5.6**	**5.4**	**4.7**	**0.26**	**0.79**
Percentage of general mean	108	111	100	97	84	4.6	14.1

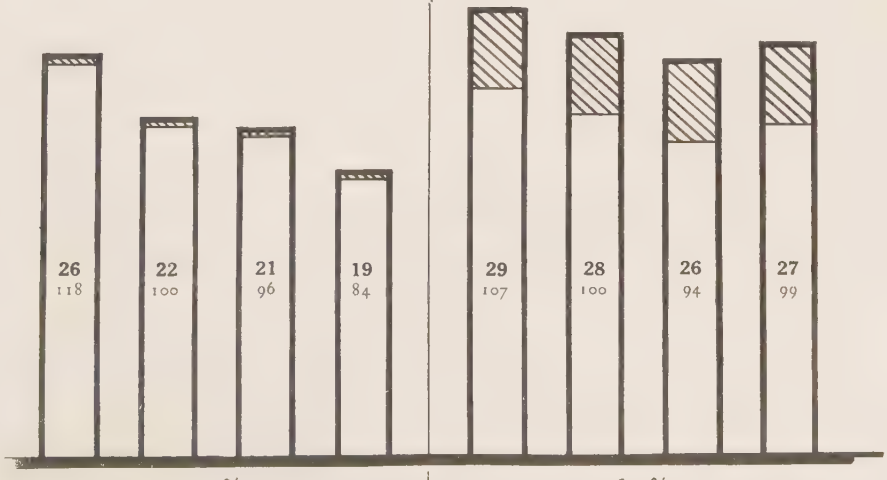
Each figure is the average of eight plots (of ninety-two plants) planted October, 1929.

TABLE IV.

Trial 2. Time of Planting (1928-29), *effect on Vigour and Cropping.*

Mean of twelve plots of 188 plants planted in : ..	Oct., 1928.	Dec., 1928.	Mar., 1929.	Apr., 1929.	Oct., 1928.	Dec., 1928.	Mar., 1929.	Apr., 1929.
Percentage of plants alive. August, 1929	**94**	**76**	**83**	**72**				
	First Year's records, 1929.				Second Year's records, 1930.			
CROP.								
Cwts. per acre	**3.4**	**1.6**	**2.9**	**1.0**	**27.8**	**20.5**	**19.8**	**16.7**
Percentage of general mean	154	74	128	44	131	97	94	79
Standard error	6.1%				4.2%			
Significant difference ..	17.9%				12.2%			
	Oct.	Dec.	Mar.	Apr.	Oct.	Dec.	Mar.	Apr.
	First Year.				Second Year.			
SIZE.								
Mean diameter of plant. cm.	**26**	**22**	**21**	**19**	**29**	**28**	**26**	**27**
Percentage of general mean	118	100	96	84	107	100	94	99
Standard error	1.7%				6.5%			
Significant difference ..	4.9%				20.4% (only six plots each).			





The shaded portion represents size of a significant difference . ·. if shaded portions overlap, difference is not significant.

TABLE V.

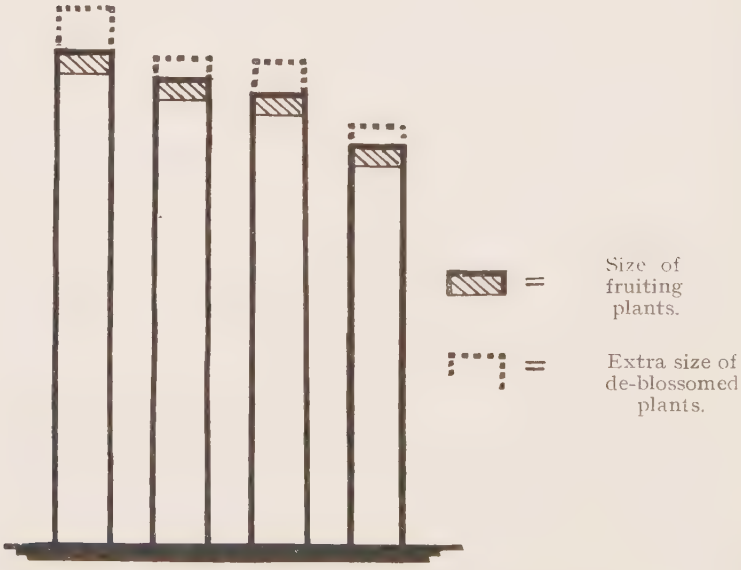
Trial 4. (*a*) *Time of Planting* (1929-30), *effect on Vigour and Cropping.*
(*b*) *De-blossoming, effect on Vigour.*

Average of six plots of 92 plants planted in :	Oct., 1929.	Dec., 1929.	Feb., 1930.	Apr., 1930.	Standard Error.	Significant Difference.
Percentage of plants alive in July, 1930	**97**	**90**	**92**	**96**	**0.93**	**2.7**
Crop, 1930. Cwts. per acre ..	**7.1**	**4.7**	**4.2**	**1.4**	**0.27**	**0.89**
Percentage of general mean ..	163	108	98	32	6.5	20.6

CROP.

Size, July, 1930.						
De-blossomed Plants.						
Diameter cm.	**35**	**32**	**32**	**27**	**0.05**	**0.16**
Percentage of mean	115	104	104	90	1.7	5.3
Fruiting Plants.						
Diameter cm.	**32**	**30**	**29**	**26**		
Percentage of mean	105	100	96	86		

SIZE.



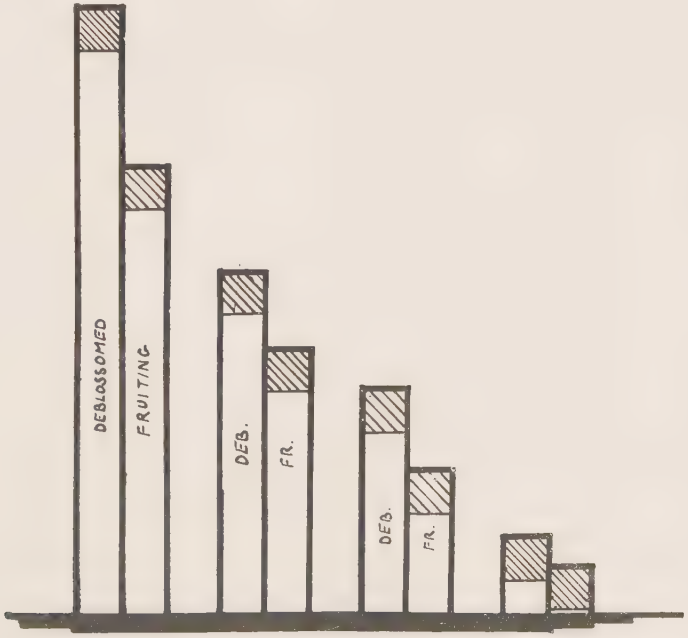
The shaded portion represents size of a significant difference.

Table VI.

Trial 4. Effect of Time of Planting and De-blossoming on Runner Production.

Average of six plots planted in :	OCT., 1929.	DEC.	FEB.	APR.	Standard Error.	Significant Difference.
De-blossomed Plants.						
Weight of runners* lbs. ..	**6.4**	**3.6**	**2.4**	**0.9**	**0.16**	**0.5**
Percentage of general mean ..	224	127	84	30		
Fruiting Plants.						
Weight of runners* lbs. ..	**4.8**	**2.8**	**1.6**	**0.5**	5.6	17.4
Percentage of general mean ..	166	98	54	18		

*Runners cut off June 7th, 1930. Per plot of 92 plants.



The shaded portion represents size of a significant difference.

(2) Time of Planting.

In order to obtain some definite information as to the effect of different times of planting under our conditions, some plots were planted in August, October and December of 1928, and in March and April of 1929. The August plants, although put in under quite good conditions, were nearly all killed by the dry conditions which followed in September. Of the other months, October gave much the best results, both in number of plants surviving, in crop, and in size of plant (see Table IV and footnote*).

The superiority of the October-planted plots continued in the second year, when they bore 27.8 cwts. per acre as against 20.5 cwts. from the December plots, and 16.7 from the April plots.

A repetition of the Time of Planting trial the following year gave even more favourable results from early autumn planting, as shown in Table V. August planting was again impossible owing to drought.

It would be foolish to state that any particular month will always be best for planting in any locality, since weather conditions vary so much, but it is clear that considerable advantage is gained by planting as early as moisture conditions will safely permit.

(3) De-Blossoming.

The blossom trusses were removed from half of the plots in the first year in Trial 4. The plants were measured immediately afterwards and again after the fruiting season. In every case the de-blossomed plants had grown larger than the fruiting plants, as shown in Table V. The increase in diameter is only about 6 per cent. on an average for all times of planting, but since it is in all directions this represents an actual increase in effective working-area of plant much larger than 6 per cent. Much more of the plant's energy, saved by not having to bear a crop, was used in increased *runner production*, however, as is shown in Table VI. This shows the weight of runner cut off (since the experiment was primarily for fruit production) in July. At that time 1 lb. of runner contained about fifty plants with leaves three inches long. In every case the de-blossomed plants had produced considerably more runners than the fruiting plants, amounting to about 32 per cent. on all times of planting.

The much larger amount of runners produced by the earlier planted plots can also be clearly seen.

* In Table IV the size of crop or of plant given by planting in different months can be seen from the length of the columns, corresponding to the figures of the actual records. The size of a difference which might result from the chance errors of the experiment is shown by a shaded portion. If the shaded portions of two columns do not overlap, then the difference between them is significant, that is greater than might occur by chance. If the shaded portions overlap, the difference is not significant.

It is evident that both de-blossoming and early planting are well worth while for runner production. The effect of de-blossoming on subsequent fruit production cannot be reported on until next season, when the de-blossomed plants bear their first crop.

Summary.

This review gives shortly the practical points made in a fuller report on strawberry cultivation experiments. Selection of parent plants and runners has considerably reduced the variation between three strains. Early autumn planting has given best results in cropping, vigour, and runner production. De-blossoming has increased diameter of plant by 6 per cent. and amount of runner produced by 32 per cent.

AN EXPERIMENT IN PLUM THINNING.

By A. C. PAINTER.

In these days of increasing competition and low market prices for the poorer grades of fruit, anything that tends to improve "Fruit Quality" should merit the careful consideration of the grower.

One of the means claimed to achieve this end by growers, who make a habit of practising it, is that of Fruit Thinning, and it may therefore not be out of place to give brief details of an experiment which would seem to give some indication of its possibilities. (A full report is being published in the Supplement to this Annual Report.)

Whilst perhaps too much stress must not be laid on a one-year experiment of this nature, it is thought that the results are sufficiently encouraging to make it worth while for growers to test out the matter for themselves.

Material and Technique.

An exceptionally heavy plum set at East Malling this year provided a favourable opportunity for testing the result of thinning on Victoria plums in a year of glut.

A selection was made of thirty ten-year-old trees, planted at 15 feet apart, in a mixed plantation. Trees were selected in pairs, each pair being as comparable as possible. One tree of each pair was thinned and the other left unthinned, making fifteen trees of each. The results obtained from the set of unthinned trees were used to ascertain what would have happened to the thinned trees had they been left unthinned.

All the trees had received the same cultural and manurial treatment throughout their life history and were all bearing a heavy crop, large sections of branches having between twenty and thirty, or even more, plums to a foot of wood.

The fruit throughout was on the small side, probably owing to intercropping and the competition with the pears and bush fruit.

The fruit was thinned by hand to about 1½ inches apart. This work was carried out by woman labour between June 26th and July 3rd, and involved the removal of some three plums in every five from the thinned trees, or over 60 per cent. of the crop.

EFFECT ON SIZE AND MARKET VALUE.

The trees were picked over twice, on August 29th and September 4th, and cleared at a third picking on September 10th. In each case the fruit was graded by eye into five size-grades and marketed under those grades. The following table shows the yield of fruit together with the net return received. (In calculating the net return, deductions have been made on account of grading, packing, transport and other marketing charges, but not on account of picking. Details of these charges are given in the appendix as being a matter of interest to growers.)

TABLE I.

Yield of Fruit (15 *trees*).

	When Thinned.		When left unthinned.	
	lbs.	Net Return.	lbs.	Net Return.
		s. d.		s. d.
Selected	15	3 3	3	9
Grade 1	122	18 1	25	3 11
,, 2	382	37 1	182	18 6
,, 3	588	22 0	677	28 0
Small	265	2 9	852	10 3
Very Small	181	loss 7	992	loss 3 5
Wastage	56	—	152	—
Totals	1,609	82 7	2,883	58 0

Difference in favour of the thinned trees .. 24s. 7d.

NOTE.—The fruit shown under the heading of " very small " was found to be unmarketable. This had, however, to be handled with the remainder and the cost of eliminating it has been put at 1d. per half sieve of 24 lbs., though in practice it was found to be considerably more. It has been thought better, however, to err on the moderate side and not to put it unduly high.

It will thus be seen that the fifteen thinned trees gave an average increased net return of 1s. 7⅗d. per tree, or £15 16s. *per acre of* 193 *trees*.

An examination of this table at once reveals two outstanding features :—

1. That, though the total yield of fruit harvested from the thinned trees was very much less than that from the unthinned, this was more than compensated for by the larger yield in the bigger grades and the higher returns received for the fruit.

2. That by far the greater proportion of the crop in the case of the unthinned trees was confined to the " small " and " very small " grades of fruit which brought in relatively little or no return.

This low-grade fruit, the handling of which involved a considerable amount of time and labour, was to a large extent eliminated by the process of thinning, thus releasing labour for other purposes at a very busy time of the year. This point is well brought out in the following table :—

TABLE II.

	Trees when thinned.	Trees when left unthinned.
Approximate total number of plums picked at time of marketing	31,000	82,500
Total weight	1,609 lbs. or 67 half sieves	2,883 lbs. or 120 half sieves
Average net return per half sieve of total crop picked	1s. 3d.	5¾d.
Net return per acre	£53	£37

From this it will be seen that thinning reduced the number of fruits to be handled by considerably more than one-half, which means, in all probability, that it would only take about half as long to deal with the crop from the thinned trees at the busy time of harvesting. Growers will realise what this means when there are large quantities of fruit to be dealt with.

Though no allowance has been made for quality in assessing its market value, the general appearance of the fruit from the thinned trees was almost invariably better than that from the unthinned, as it was of a generally brighter colour, whilst much of the latter was of a dull, muddy red.

COST OF THINNING.

Against the increased returns must be put the additional cost entailed by the thinning. This has been somewhat difficult to estimate. Under our experimental conditions, where care has to be exercised to obtain an even thinning of the fruit so as to interfere as little as possible with other experiments in hand, the cost, done by women, who had had little previous experience, worked out at about 1s. 9d. a tree. (This included a man's time to supervise, move stools, etc.) Under commercial conditions, however, it is not thought that it would have exceeded a maximum of 1s. to 1s. 3d. per tree.

In deciding what part of this sum should be charged against the increased returns it must be remembered that the fruit in any case has to be picked some time or other and that every plum removed when thinning means one less to be picked when the crop is marketed. In this experiment, as has already been

shown, some three plums out of every five were removed at thinning, thus leaving considerably less than one-half of the original crop to be harvested, and it is therefore obvious that the cost of picking the thinned trees for market will be very much less than that of the unthinned.

When this is taken into consideration, it seems that if the sum of 6d. or 7d. a tree were charged up as the extra cost entailed, this should prove to be a sufficient margin. Thus, allowing the sum of 7d. per tree, for our plant the cost of thinning works out at £5 13s. per acre. Deducting this from the figure of £15 16s. previously arrived at, we still get a net return of £10 3s. per acre in favour of the thinned trees, apart from any consideration of quality or damage done to the trees, reference to which has been made elsewhere.

It has been presumed that the trees would be picked over two or three times and not merely stripped at one picking.

The method adopted in arriving at this figure has been gone into in some detail, as it is realised it is a matter of importance in deciding whether thinning is worth while or not.

Effect on Tree.

All the trees were well shored up by poles to prevent branches being broken down by the weight of fruit. Rough winds were, however, experienced, both in July and August, resulting in a certain amount of damage in the plantations. The trees used in this experiment suffered as follows :—

Thinned trees.

12 trees	..	No damage.
3 trees	..	1, 2 and 8 small branches respectively broken down, a total of 11 in all.

Unthinned trees.

1 tree	..	No damage.
14 trees	..	Between them had 18 large, 12 medium-sized and 8 small branches broken down.

Thus, while the damage to the thinned trees was practically negligible, the unthinned trees, which were bearing a much heavier weight of fruit, suffered severely, and this must almost certainly have some effect on their future yield. This is quite apart from any possible effect of the strain on the unthinned trees of carrying a break-down crop and the risk of infection by the Silver Leaf fungus through the broken branches.

Summary.

1. A one year experiment on the thinning of Victoria plums in a year of heavy set is described, which, under the conditions obtaining, gave

(a) a definite increase in the size of the fruit on the thinned trees.

(b) a definitely higher net return for the fruit, in spite of a much lower aggregate yield.

2. The cost of thinning is discussed.

3. Most of the crop from the unthinned trees consisted of low grade fruit of little or no market value. This was largely eliminated by thinning.

4. Whilst labour has to be found for thinning there was a considerable saving of both time and labour when it came to the picking and marketing of the fruit.

5. Whilst wind damage was almost negligible in the case of the thinned trees, considerable damage was done to the unthinned trees.

APPENDIX.

Cost of Grading and Marketing.

The fruit was marketed in different packages according to quality, the "Selected" and Nos. 1 and 2 grades being packed in 12-lb. chips, grade 3 in half sieves and "Smalls" in bushels.

To enable a ready comparison to be made, the cost of marketing 24 lbs. of fruit in each case has been given.

Cost of Marketing 24 lbs. of Fruit.

	Selected in 12-lb. chips.		Grade 1 in 12-lb. chips.		Grade 2 in 12-lb. chips.		Grade 3 in ½ sieves (of 24 lbs.).		Small in Bushels (of 48 lbs.).	
	d.		d.		d.		d.		d.	
Grading	1.0		1.3		1.3		2.0		3.0	
Rail Charge ..	6.5		6.5		6.5		3.5		3.5	
Cost of Package ..	7.6		7.6		7.6		0.9		0.6	
Handling and Cartage ..	0.7		0.7		0.7		0.5		0.5	
Salesman's Commission (Average) ..	6.7		4.6		3.5		6.0		4.0	
Total cost per 24 lbs. of Fruit ..	22.5		20.7		19.6		12.9		11.6	
	Gross.	Net.	Gross.	Net.	Gross.	Net.	Gross.	Net.	Gross.	Net.
Market Price per 24 lbs. of Fruit	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
29 Aug.	6 0	4 3	4 0	2 4	3 0	1 5	1 3	2	1 0	½
4 Sept.	8 0	6 1	6 0	4 3	4 0	2 4	2 0	11	1 3	3
10 Sept. ..	8 0	6 1	5 6	3 9	4 9	3 1	2 9	1 8	1 6	6
Size of Fruit (Approx. No. to 1 lb.)	8–10		11-12		13-15		16-20		24-32	

NOTES.

(*a*) *Grading.*—The actual cost of grading the plums for this experiment is given, but worked out somewhat higher than usual as greater care had to be exercised to get the grading even. The proportional cost, however, would be the same in any case. As the cost of grading the smaller plums is very much higher it is obvious that the fruit from the unthinned trees is much more expensive to grade than that from the thinned.

The time occupied in grading depends more on the *number* of plums to be handled than on the weight.

See also further remarks below.

(*b*) *Rail Charges.*—The charges in the case of the chips are at passenger rates and the bushels and half sieves at goods rates.

(*c*) *Cost of Packing.*—This in the case of the half sieves and bushels consists of cost of lining paper and sticks and transport charges of empties from salesman to farm.

(*d*) *Handling and Cartage.*—Represents the cost of doing up the package and cartage to Station.

(*e*) *Salesman's Commission.*—In the case of the chips this varies with the market price. In the case of the half sieves and bushels it was 6d. and 8d. respectively. In this connection it must be remembered that salesmen's charges differ from market to market and from one salesman to another.

Though many growers would doubt the necessity of grading the fruit into so many size grades, it is thought that in practice it justified itself and that the prices made, considering the glut of fruit, must be considered satisfactory. Apart from the " small " grade (marketed in bushels) only a few half sieves of grade 3 fruit in one consignment fetched less than 2s. a half sieve and the better grades very much more than this.

No ungraded fruit was marketed with which a direct comparison can be made though growers can possibly compare prices with their own returns.

Grading is not an expensive matter—it is more a question of finding the labour. In grading consignments of plums from thinned trees, where the amount of small fruit was not unduly high, it has been found that four women can grade a ton of Victoria plums by hand in about four hours, which represents a cost of approximately 1d. per 24 lbs. It is suggested that thinning, by reducing the quantity of fruit to be handled at picking, will release labour that the grower might profitably employ for the purpose of grading.

Part II

Physiology

Part II

PHYSIOLOGY

Vegetative Propagation.

Investigations on the influence of external conditions upon the rooting of hardwood cuttings have been continued. A preliminary experiment has indicated that improved rooting may be obtained by placing a layer of sphagnum moss below the sand in which the cuttings are planted ; this experiment is being repeated this year. A repetition of the experiment with shelters has again failed to give satisfactory results ; this year a different type of shelter will be tried.

An attempt is being made this season to improve rooting by altering the internal condition of the cutting. Knife edge rings were made in the bark of actively growing shoots, and cuttings were subsequently taken from these shoots, the basal cut being made exactly at the ring.

It is hoped in this way to induce an accumulation of food in the region of stem subsequently used as cutting and to start the wound-healing processes under optimum conditions.

The relative effect of ringing the shoot two months, two weeks and one week before making the cutting is being investigated.

Leaf Relation of Apple Trees.

This investigation is being continued. Next season an attempt will be made to get some measure of the relative amount of leaf surface per unit length and per unit weight of stem in the case of older trees of the principal scion varieties worked on the more important stocks.

Growth.

Stem Diameter and New Shoot Growth.

The results of this investigation have now been published ; they provide some indication of the manner in which the previously recorded differences between furnished and unfurnished stems after a season's growth are arrived at, and show how the differences in the progress of the downward "wave" of cambial activity from newly developing shoots are reflected in the girth of older stems.

Seasonal Course of Root and Shoot Development in Apple Stocks.

The results of this investigation, carried out last year, are being analysed and a larger scale experiment on the same lines has been started. A thousand unworked one-year-old trees of No. XIII were planted out last spring, and the course of development of the various organs, during the first two years after planting, is being followed by lifting samples of fifty at intervals of about five weeks and determining the increments in weights of roots, shoots and leaves by taking their fresh and dry weights.

The Effect of Scion on Root.

The results of a quantitative morphological examination carried out in collaboration with the pomological section on some series of young trees lifted in 1927 have been published. The results indicate that the amount of fibre or small roots expressed as a percentage of the total root system decreases as the root system grows in size, and that the variety used as scion may influence the total amount of root formed by the stock and thus indirectly alter the percentage of fibre.

The distinctive morphological features characteristic of the root-systems of the various stocks were not appreciably changed by the variety used as scion.

A further series of trees lifted in collaboration with the pomological department last winter included trees where the scion had been worked direct on to piece-roots of stocks as well as others worked on rooted stems. The results have been published and indicate that, for the varieties of scion and stock used, the root system of the stock retains its characteristic features irrespective of scion variety or of the methods of working.

Excavation of Root Systems.

The results of these investigations carried out in collaboration with the pomological department, are being prepared for publication.

PUBLICATIONS DURING THE YEAR.

Knight, R. C. SOME EFFECTS OF PRUNING "LEADERS" AND OF THE ABSENCE OF "LATERALS" ON THE RATE OF GROWTH OF STEMS OF APPLE AND PLUM. Journ. of Pom. and Hort. Sci. (May, 1930). **8.** 93-105.

Summary.

The absence of lateral shoots on older stems had practically no influence on the rates of extension growth or of diameter increase of newly developing shoots.

Stems carrying no laterals show lower rates of diameter increase throughout the season than normally furnished stems. The lower region of the former grows more slowly than the upper region in the early part of the season, but later the position is reversed. In the " feathered " stems, the lower region grows as rapidly as the upper and much faster thereafter.

Measurements of plum trees have given results of a similar nature.

Although the new shoots of leader-pruned apples behave quite differently from those of unpruned trees, the increase in diameter of older stems of the former follows a course resembling that of older stems of " defeathered " trees.

The results provide some indication of the manner in which the previously recorded differences between furnished and unfurnished stems after a season's growth are arrived at, and show how the differences in the progress of the downward " wave " of cambial activity from newly developing shoots are reflected in the girth of older stems.

Vyvyan, M. C. THE EFFECT OF SCION ON ROOT.—III. COMPARISON OF STEM AND ROOT-WORKED TREES. Journ. of Pom. and Hort. Sci. (August, 1930). **8.** 259-282.

SUMMARY.

The distinctive characters of the root-systems of two year old No. II., and No. VI. stocks remained approximately constant whether unworked, worked with scions of their own variety or with Beauty of Bath or Grenadier and whether the latter were root-grafted on to piece roots or stem-grafted.

No. VIII. worked with Beauty of Bath was likewise little affected by the method of working.

Root-systems of free seedling stocks failed to take on distinctive characters when worked with Beauty of Bath and Grenadier respectively whether or not a length of stock stem was left below the graft union.

Grenadier always gave a relatively larger root-system than Beauty of Bath and, in consequence, a smaller percentage of fibre.

Part III

Biochemistry

Part III

BIOCHEMISTRY

1. Stock Influence.

Ash Analysis.

Heyrovsky's polarographic method for estimating minute amounts of metallic elements has been simplified ; it is hoped that this will soon be a routine method of analysis, applicable to many of the twenty-one elements occurring in apple tree ash and that spectographic methods will be applicable to the remainder.

Functions of Ash Constituents.

Modifications of the injection method have been worked out for testing the effects of the various elements in the ash on young rootstocks and worked trees. These methods have been used in preliminary experiments on the following compounds : potassium molybdate, lithium nitrate, sodium chloride, potassium chloride, magnesium chloride, copper chloride, silver nitrate, ammonium chloride, ammonium nitrate, potassium nitrate and potassium dihydrogen phosphate.

2. Resistance of Different Rootstocks to Insect Attack. (Jointly with Entomological Section.)

Causes of Resistance to Woolly Aphis.

The practical aim of this work is to provide a rapid laboratory method for testing the susceptibility of new seedlings to replace the present time-consuming one. This necessitates some explanation of the nature of the resistance, which might also simplify the work of breeding new resistant varieties.

The bark extracts of immune trees were introduced into susceptible ones, and vice versa. The trees were inoculated with woolly aphis, in some experiments before treatment and in others some days after treatment. No change in degree of susceptibility was detected in any of the trees so treated.

Several methods of feeding woolly aphides on artificial media in the laboratory have been tested ; of these, two appeared more hopeful than the rest. In the more fully worked out method the aphides were placed on six per cent. agar medium in a Petri dish. Insects so treated lived up to twenty-six days, whereas similar starved ones lived only ten days. The second method was devised for cases in which only a few drops of liquid medium were available.

A single drop of the liquid was hung on a membrane supported between two microscope glass rings. Both methods enabled detailed observations to be made with the binocular microscope of the mouth parts of the feeding insects under reasonably aseptic conditions ; the mouth parts were frequently observed embedded in the medium.

Preliminary tests have shown that the acid constituents of the bark vary from variety to variety ; these are being examined chemically to determine whether any are associated with resistance to woolly aphis attack.

PUBLICATIONS DURING THE YEAR.

Roach, W. A. SULPHUR AS A SOIL FUNGICIDE AGAINST THE POTATO WART DISEASE ORGANISM. Journ. of Agric. Science. (January, 1930). **20.** 74-96.

SUMMARY.

Thiosulphuric acid has been shown to exist in a free state.

It is relatively stable in dilute solution ; M/200 solution is only half decomposed at the end of one day and an M/400 solution at the end of ten days only.

This degree of stability is sufficient to account for the fungicidal action of acidified thiosulphate solutions in terms of the liberated thiosulphuric acid.

It can be calculated that it is only necessary to assume 6 per cent. of the minimum quantity of sulphur found effective against Wart Disease in the field to be in the form of thiosulphuric acid over a period of ten days in order to account for its toxicity.

(The above is in continuation of work carried out at the Rothamsted Experimental Station.)

Roach, W. A. INCREASED SCION VIGOUR INDUCED BY CERTAIN FOREIGN ROOT-STOCKS. Annals of Botany. (October, 1930), **44.** 859-864.

SUMMARY.

Three examples are described of a scion being more vigorous when grafted on a foreign root-stock than on its own.

Woody nightshade (*Solanum Dulcamara*) attained more than twice its normal weight when grafted on potato (*S. tuberosum*), and assumed a more branching habit. *Vicia narbonensis* at first grew abnormally tall when grafted on *V. faba,* and then was overtaken by the self-grafted plants, becoming unhealthy before reaching maturity ; flowering was earlier.

Lupin when grafted on broad bean was of greater girth and height than when on its own roots.

In the three reciprocal grafts the root-stock had a dwarfing effect.

(The practical work was carried out at the Rothamsted Experimental Station.)

Part IV

Plant Pathology

Mycology and Bacteriology

Part IV

PLANT PATHOLOGY

MYCOLOGY AND BACTERIOLOGY

I. Crown-Gall.

The Relative Susceptibility of Apple Stocks to Crown-Gall.

An experiment has been carried out to test, under controlled conditions, data obtained from examining naturally infected trees in the field. The method adopted was to plant up, in pots, comparable series of young stocks and to inoculate them in spring from a pure culture of *Bacterium tumefaciens*, the results being tabulated the following winter. A preliminary experiment was carried out in 1929 on two varieties, viz., No. 7 (very susceptible under field conditions) and No. 1 (resistant in the field), a unit of 100 of each being used. The two varieties gave markedly different results; for example sixty-seven No. 7 stocks developed galls as against thirty-seven No. 1 stocks.

In 1930 a further experiment was started on a larger range of varieties, but the results are not yet available.

II. Brown-Rot Diseases.

Experiments have been carried out with *Sclerotinia cinerea* to ascertain the manner of infection of leafy shoots in plum trees. Leaves of young plum trees in pots were inoculated with conidia of the fungus growing in pure culture. It was found that infection of the leaves readily took place through wounds, but under the conditions of the experiments no infection occurred on leaves not injured.

III. Effect of Rootstock on the Susceptibility of the Scion.

Another year's detailed records of the incidence of Apple Scab and Apple Mildew on the leaves and fruits of Cox's Orange Pippin on the spraying trial plot have been made. The data have not yet been fully examined. Broadly speaking, however, it is evident that the more outstanding results obtained in previous years are being confirmed, and that there is again evidence that the rootstock influenced the degree of infection of this scion variety by both these diseases.

IV. The Pathology of the Raspberry and Other Species of Rubus.

(1) *A Form of Die-Back in the Lloyd George Raspberry.*

Enquiries have been received this year from various parts of the country relative to a serious dying out of canes and stools early in the season, particularly in the variety *Lloyd George*. The chief characteristic of this disease is a rotting at the crown followed by the death of some or all of the roots. In most cases a species of *Fusarium* was present on the diseased roots and crowns. This fungus was isolated in pure culture and experiments are in progress to test its parasitism.

(2) *Raspberry Cane Blight.*

A further serious outbreak of this disease was investigated in 1930 on a farm at East Malling, the affected variety being *Reader's Perfection*. Experiments on methods of control were started on this plantation and also on the plantation of the variety *Bath's Perfection*, noted in last year's Report. The fungus causing the disease has also been found on the variety *Lloyd George*.

Perithecia of a fungus closely conforming to the description of *Leptosphæria Coniothyrium* were found on a raspberry cane in close association with pycnidia of *Coniothyrium Fuckelii*, which has been proved by inoculation experiments to be the cause of the disease. Subsequently the same fungus was found on a cane received from the Midlands. Cultural and inoculation experiments to determine the relation between the two forms are in progress.

(3) *Raspberry Mosaic.*

The analysis of symptoms by grafting methods has been continued. Field experiments have been planned to determine (a) the method of spread of infection in a commercially laid out plantation and the possibility of control by roguing, and (b) the possibility of raising and maintaining mosaic-free cane of well-known commercial varieties for propagating purposes. The first experiment has now been concluded but the full results have not yet been collated. In the second experiment particular attention has been paid to the two varieties *Lloyd George* and *Baumforth Seedling B*. On the extensive plantings of these two varieties only four canes have shown mosaic symptoms throughout the season. The total yield of mosaic-free cane of these two varieties this year is 3,200 canes. A part of this material will be used for pot experiments and the remainder will be distributed to certain growers and advisory officers in the county for the purpose of starting replicate propagation trials. The subsequent behaviour of the cane after its distribution and planting will be followed up.

(4) *A Disease of Blackberries.*

A severe outbreak of a disease on a commercial plantation of blackberries was investigated early in the year. A species of *Septoria* was present on the dead canes. This fungus has been isolated and its parasitism is being tested.

Observations suggested that the outbreak was largely due to the method adopted in training the bines and to the manurial treatment. Preliminary experiments in control, based on those data, have been made.

V. Bacteriosis in Plum and Cherry Trees.

(1) *Bacterial Shoot Wilt of Plum Trees.*

A detailed study (by cultural and inoculation experiments extending over several years) has been made of an organism which causes a bacterial shoot wilt of plum trees. As, apparently, the organism had not previously been described, the name *Pseudomonas prunicola* was proposed for it, and a full description of it has been prepared.

(2) *Bacterial Canker of Plum and Cherry Trees.*

The organism causing this disease is being studied particularly for comparison with *Ps. prunicola:* the two are found to be different in certain cultural characters. Field experiments have been carried out on young plum trees to test the effect of the application of certain fertilizers on the intensity of infection; there was no significant difference in the number of trees cankered on the treated and on control plots.

VI. Walnut Bacterial Blight.

Foliage from walnut trees in various localities has been examined to see whether there is any evidence of the presence of *Pseudomonas juglandis* on established trees in this country. As a result, bacterial spots were found on leaves from a tree in Worcestershire and one in Kent. A yellow organism was isolated in each case. Cultural and inoculation tests are being applied to ascertain whether these organisms are identical with *Ps. juglandis.*

VII. Apple Spraying Field Trials.

Field trials of various sprays for the control of Apple Scab and Apple Mildew have been continued. Observations during the past year have been concentrated on infection of the fruit, and large crops have been scab-graded. The figures are now available but they have not yet been classified. A special study has been made of fruit-drop and of fruit-russeting following the application of sprays. It is most noteworthy that the greatest russeting and cracking blemishes on Cox's Orange Pippin fruits occurred as a result of the *pink-bud* application. This severe injury was clearly noticeable before the fruits were picked.

VIII. Apple Cracking and Branch Blister Disease.

Efforts to establish the parasitism of a fungus isolated from russeted fruits and blistered twigs of apple were inconclusive in 1930. The russeting and

blistering symptoms have been very widespread during the year. Certain data on the appearance of fruit russeting in relation to the application of spray fluids have been collected, but they have not yet been analysed.

Fungi similar to that found on apple have now been isolated from blemished pear, quince and plum fruits, and cultural comparisons of these with a type culture of *Coniothecium chomatosporum* Corda are contemplated. Material is being prepared for a further series of inoculations.

IX. The Verticillium Disease of the Hop.

An outbreak of this disease has occurred this year at Matfield, Kent. This is the third locality in this country where the disease has been found, the other two being Penshurst, Kent, and near Hereford. In each case, severe damage has been caused, particularly at Matfield. Cultural studies of the parasite are being made and field data are being collected with a view to elaborating methods of control.

PUBLICATIONS DURING THE YEAR.

Wormald, H. BACTERIAL "BLIGHT" OF WALNUTS IN BRITAIN. Annals of Applied Biology. (February, 1930). **17.** 59-70.

Summary.

(1) An organism has been isolated from lesions on leaves, shoots, and fruit of young walnut trees at the East Malling Research Station, Kent.

(2) This organism was proved to be pathogenic by positive results obtained from inoculation on walnut leaves and shoots.

(3) It corresponds closely to descriptions of *Pseudomonas juglandis* and is therefore referred to that species.

Moore, M. H. APPLE SCAB AT EAST MALLING. East Malling Res. Sta. Ann. Rep. for 1929. (April, 1930). (I.—General). 72-75.

Summary.

The practical importance of the following points in their application to successful control of Apple Scab has been reviewed :—

(1) The time of application of sprays. Special emphasis is laid on the value of the "pink-bud" application.

(2) The seasonal factor.

(3) The influence of rootstock.

(4) The influence of manuring.

Moore, M. H. APPLE SCAB: ITS INCIDENCE AND CONTROL AT EAST MALLING. Annals of Applied Biology. (May, 1930). **17.** 419-424.

SUMMARY.

This paper presents in detail the results obtained in three years' investigation of the problem at East Malling. The effect on the amount of scab infection of spraying, of manuring, and of rootstock is dealt with, and the methods used for obtaining results are described. Bordeaux Mixture is shown to be the best " Scabicide " to use, but it is unsafe on Cox's Orange Pippin, for which variety lime-sulphur is therefore recommended. Three applications, one at the " pink bud " stage, and two after blossoming, gave very satisfactory results.

Harris, R. V. THE CAUSES OF " RUNNING-OUT " AND NON-CROPPING OF THE RASPBERRY. Kent Cherry and Soft Fruit Show Catalogue. (July, 1930). 3-7.

SUMMARY.

This article, written for raspberry growers, sets out the distinguishing characteristics, and the relative commercial importance of the diseases to which the raspberry is most susceptible in this country. The diseases mentioned are: Cane Spot, Cane Blight, Spur Blight, Botrytis Rot, Blue Stripe Wilt and Mosaic.

Control measures, where such are commercially practicable are summarized.

Moore, M. H. THE INCIDENCE AND CONTROL OF APPLE SCAB AND APPLE MILDEW AT EAST MALLING, Part I. Journ. of Pom. and Hort. Sci. (August, 1930). **8.** 229-247.

SUMMARY.

This contribution (Part I.) deals solely with Apple Scab.

(1) A full description is given of certain spraying experiments on the control of scab, together with the methods used for obtaining comparable results.

(2) The results obtained are tabulated and discussed. Bordeaux Mixture applied three times gave the best control, but lime-sulphur is preferred on Cox's Orange Pippin as being safer on this variety. Colloidal sulphur (post-blossom) was less fungicidal. The importance of the " pink-bud " application is emphasised.

(3) The scab " Pustule " on the young shoots of Cox's Orange Pippin is described.

(4) A preliminary trial of sulphur dusts against scab is described. The results are not very conclusive owing to the slight amount of infection.

(5) It is shown that both the rootstock and manurial treatment had a marked influence on the degree of infection.

Wormald, H. BACTERIAL BLIGHT OF WALNUTS. Gardeners' Chronicle. (September, 1930). **88.** 216-218.

SUMMARY.

The symptoms of the disease are briefly described. Nurserymen and owners of walnut trees are asked to obtain a diagnosis of any suspicious-looking lesions so that the distribution of the disease may be ascertained and steps taken to prevent its dissemination.

Measures (based on facts known about the disease and its cause) are suggested for controlling the disease on young trees.

Wormald, H. FURTHER STUDIES OF THE BROWN-ROT FUNGI. V.—BROWN-ROT BLOSSOM WILT OF PEAR TREES. Annals of Botany. (October, 1930), **44.** 965-974.

SUMMARY.

(1) A blossom wilt of Fertility pear trees is described.

(2) The fungus associated with the disease is morphologically and in culture indistinguishable from *Sclerotinia cinerea* forma *pruni*, and is therefore referred to that species.

(3) Inoculation experiments carried out with the fungus isolated from pears spurs have given rise to typical blossom wilt on pear trees.

(4) Inoculation experiments on pear flowers using strains of *S. cinerea* f. *pruni* isolated from plum and from cherry have also resulted in blossom wilt.

Wormald, H. FURTHER STUDIES OF THE BROWN ROT FUNGI. IV.—*SCLEROTINIA FRUCTIGENA* AS THE CAUSE OF AN APPLE CANKER. Trans. of Brit. Mycol. Soc. (November, 1930). **15.** 102-107.

SUMMARY.

A description is given of a severe infection of Melon apple trees by *Sclerotinia fructigena*.

Not only was the fruit infected, but the infection extended into the spurs, and also into the branches to cause cankers. These cankers girdled the branches and killed the parts terminal to them.

Monilia pustules appeared on the infected parts during the period of infection (August); these ceased to function on the approach of winter but another crop of pustules appeared the following June.

Brief reference is made to similar infection on four other varieties of apple.

Wormald, H. BACTERIAL DISEASES OF STONE-FRUIT TREES IN BRITAIN. II.—BACTERIAL SHOOT WILT OF PLUM TREES. Annals of Applied Biology. (November, 1930). **17.** 725-744.

SUMMARY.

A bacterial shoot wilt, observed at the East Malling Research Station in 1923 and 1924, is described.

A bacterium isolated from infected shoots has been shown by inoculation experiments to be the cause of the disease.

The organism not only infects young green shoots, but experiments have shown that it can also cause leaf spots, and that it can induce gummosis and cankers on woody branches and on stems.

Cultural studies of the organism suggest that it has not previously been described, so the name *Ps. prunicola* is proposed for it.

Moore, M. H. THE INCIDENCE AND CONTROL OF APPLE SCAB AND APPLE MILDEW AT EAST MALLING. Parts II and III. Journ. of Pom. and Hort. Sci. (December, 1930). **8.** 283-304.

SUMMARY.

This contribution deals with Apple Mildew (Part II) and with Spray Injury Part III).

(1) Spraying experiments on Cox's Orange Pippin showed that three applications of lime-sulphur gave the best results in mildew control, Bordeaux Mixture being ineffective. Lime-sulphur also gave good control on Stirling Castle, but proved too harmful to recommend for this variety. Two post-blossom applications of Colloidal Sulphur were not very effective.

(2) Soda-soap solution (20-10-100), post-blossom, proved effective against mildew, but harmful to the variety Belle de Boskoop. Lime-sulphur and dusting sulphur also showed control on this variety.

(3) The rootstock is shown to influence the degree of infection by mildew, Stock No. I. consistently inducing susceptibility in Cox's Orange Pippin.

(4) Cox's Orange Pippin was considerably damaged by applications of Bordeaux Mixture. Fruit russeting, loss of crop, leaf scorch and defoliation were observed. A " pink-bud " application caused severe russeting and cracking of the fruits.

Wormald, H. RIPE ROT OF GRAPES. Gardeners' Chronicle. (December, 1930). **88.** (Third series), 498-500.

SUMMARY.

A Ripe Rot of Grapes, occurring in greenhouses at Hawkhurst, Kent, and at Tring, Hertfordshire, in September and October, 1930, is described. *Gloeosporium fructigenum*, the conidial stage of *Glomerella cingulata* was present on the infected grapes. Some thirty millions of living conidia were obtained from a single grape, thus showing the infectious nature of the disease. The fungus was isolated from a grape and grown in pure culture ; when inoculated into apples it produced the typical symptoms of Bitter Rot. Recommendations for controlling the disease under greenhouse conditions are given.

THE CAUSES OF "RUNNING-OUT" AND NON-CROPPING OF THE RASPBERRY.*

By R. V. HARRIS.

In last year's catalogue of the Cherry and Soft Fruit Show, a brief reference was made to some of the causes of the running-out and non-cropping of Raspberry Stocks which are under investigation at East Malling Research Station. This year we propose to deal in greater detail with this work in its bearing on modern raspberry growing.

Raspberry diseases fall conveniently into two groups: (1) The first group consists of diseases which can be eradicated from the infected stool by such methods as the removal of diseased canes or spraying, and includes the following fungus diseases: *Raspberry Cane Spot, Cane Blight, Spur Blight* and *Botrytis Rot.* (2) The second group contains diseases which cannot be eradicated from a stool once it is infected. The only way of dealing with such diseases is by planting up with resistant varieties or by taking precautions to protect the plantation from infection. In this group we put the *Blue Stripe Wilt* and *Raspberry Mosaic.*

Group I.

Of the four diseases mentioned in the first group, two only, *Cane Spot* and *Cane Blight,* are likely to cause serious damage to the crop.

(1) *Cane Spot.*

This is the most widely distributed disease of the two, and, with the possible exception of Mosaic, is the disease most generally met with on raspberry canes. Fortunately serious attacks are confined to about half-a-dozen varieties, the most susceptible being *Baumforth Seedling B.* It is safe to say that, in the great majority of localities where this variety is grown, control measures against this disease will greatly increase its vigour and cropping power. Experiments carried out at East Malling show conclusively that the disease can be controlled by destroying badly spotted canes during the spring thinning of the stools and by spraying with Bordeaux Mixture or Lime Sulphur. The recommended schedule is described in the Fifteenth Annual Report of the Station.

(2) *Cane Blight.*

This is a disease which is becoming increasingly prevalent and serious. In 1929 and during the present year two serious outbreaks on the varieties

* Reprinted from the Kent Cherry and Soft Fruit Show Catalogue, July 15th, 1930.

Bath's Perfection and *Reader's Perfection* have been examined. A very large proportion of the fruiting canes were killed out in the Spring in both the affected plantations. Canes are infected during their first year and large cankers are produced, usually near ground level. In the majority of cases, the region of the cane above the canker is killed. Fungus spores produced from these cankers infect the new canes the following Spring. Experiments on the control of this important disease are now in progress.

The remaining two diseases in the group are unlikely to cause serious damage except under exceptional circumstances. *Spur Blight* is recognised by the dark patches forming round the leaf bases from cropping time onwards. These patches become silvery white and covered with black dots when the cane is mature. As a rule, only individual buds in the neighbourhood of the lesion are killed out, with the result that the infected canes tend to be badly furnished with laterals. The disease has not yet proved sufficiently serious to warrant experiments in control.

An attack of *Botrytis Rot* took place in a Lloyd George plantation in the Midlands in the wet season of 1927. Probably owing to better weather conditions in 1928 and the prompt removal of diseased canes, the disease has not reappeared subsequently.*

GROUP II.

We now come to the second group of diseases, viz., *Blue Stripe Wilt* and *Mosaic*. In both these diseases the seat of the trouble is inside the plant.

(1) *Blue Stripe Wilt.*

In the case of *Blue Stripe Wilt*, infection probably takes place from the soil and the causal fungus passes from the root system all over the plant, causing a certain proportion of the canes to die back. Obviously, therefore, spraying or the cutting out of wilting canes are not effective means of control. It has been found, however, by experiment that the question as to whether many canes are killed off by the disease is largely dependent on certain external conditions such as soil and weather, so that a plantation which is badly affected one year may be apparently normal and healthy the next year. This means that under favourable conditions the fungus may be present in stools showing no apparent signs of damage.

In view of these facts, the roguing out of stools showing symptoms of disease would appear to be as unprofitable as it is unnecessary. In the rare cases where the disease becomes economically serious, the best procedure would be to grub the plantation and plant up with a variety which has proved itself more resistant to the disease under local conditions.

* Since this article was written another outbreak of this disease, on a larger scale, has taken place on the same farm.

(2) *Raspberry Mosaic.*

The remaining disease, *Raspberry Mosaic*, stands in a class by itself. The well-known mottling and curling of the foliage of raspberry canes which has been familiar to growers for many years has now been proved by experiment to be a symptom of a highly infectious disease. It belongs to a class known as " Virus Diseases," which are caused by an agent so small as to be invisible under the most powerful microscope. Once infection takes place this " Virus " travels rapidly to every part of the stool including the spawn, and, once inside, the disease can never be eradicated. Experiments have shown that, in most varieties, the result of infection is a slow but sure loss of the vigour of the stool with an attendant reduction in crop. Eventually it will probably die out, but meanwhile, in the early stages of the disease, if such a stool is divided, it will give rise to a number of stools which are themselves infected. Further experiments have also shown that infection spreads naturally at an appreciable rate (by an agent not yet known) from an infected stool to its neighbours in the row. From these facts, it will be readily deduced that unless some precautions are taken to maintain a stock of disease-free canes for propagation, the disease will, gradually at first and then at an increasing rate, permeate a given variety and permanently impair its efficiency. The case of the well-known variety *Lloyd George* might be cited as an example. In 1923, it was only with difficulty that a case of Mosaic was discovered here and there at East Malling and elsewhere. Subsequently the disease has spread with increasing rapidity, and now it is rare to find a plantation of this variety which has less than 3 per cent. infected stools and the majority of plantations have a considerably greater proportion. The deterioration of the affected stools (due to the disease) is also becoming increasingly noticeable. It is very probable then that unless precautions are taken to preserve a disease-free stock, before very long the well-known vigour of this variety will be permanently lost. If would be out of place here to describe in detail the experimental work at East Malling in regard to the control of *Raspberry Mosaic*, but the following points may be of interest :

1. Field experiments show that on a plantation of commercial dimensions planted up with a good average sample of *Lloyd George* canes, it is a difficult task, in the present state of *Lloyd George* stocks, to check the spread of Mosaic by removing or roguing diseased stools periodically. If such methods are tried by growers there is but little chance of success : (1) unless the sample of cane for planting contains a very low percentage (not more than 3 per cent.) of mosaic stools ; (2) unless " roguing " is started during the first growing season ; (3) unless the apparently healthy stools on either side of diseased stools are also removed and destroyed.

2. At East Malling a special plot has been laid down for the specific purpose of propagating a stock of Mosaic-free canes of some twenty commercial varieties, including *Lloyd George*, to form the basis of future cropping trials. Up to the present stage of this experiment, it has been found that from a small stock of specially selected cane, it is an easy matter to build up rapidly a disease-free stock of canes for propagation purposes.

3. Finally, one might conclude by saying that the only ultimate solution to the problem of Mosaic would seem to lie in the following direction: If a susceptible variety such as *Lloyd George* is thought to be worth preserving in its original vigour, certain nurserymen and growers might be encouraged to lay down plots designed for the specific purpose only of propagating stocks of cane guaranteed free from Mosaic. This would form a reservoir for maintaining healthy plantations of the variety in question at a time when the disease has got hold of the ordinary commercial stock.

Enquiries from growers troubled with disease in their raspberries will be welcomed at the Research Station and advice will be gladly given.

Part V

Entomology

Part V

ENTOMOLOGY

Spraying Trials against the Fruit Tree Red Spider.

(*a*) *Winter Washes.*

Further investigations in relation to the control of the Fruit Tree Red Spider of plum have been continued in the field. A caustic wash, four different preparations of white oil emulsions, a white oil emulsion combined with a tar-distillate, and a lubricating oil, of declared consistency, containing 2 per cent. oil, were tested.

All the sprays were applied at the strength of 5 per cent. during January, but none of the treatments proved to be sufficiently toxic to the eggs of this mite to justify their use on a larger scale.

(*b*) *Spring and Summer Washes.*

It has been established that a 1 per cent. lime-sulphur spray, applied approximately ten days after the blossom period, will control the Fruit Tree Red Spider which occurs on plums. This treatment does not reduce the crop or damage the trees in any way.

Two reports have been published during the year.

Resistance of Different Rootstocks to Insect Attack.

The collection of layered apple stocks (raised from immune seedlings) which proved to be resistant to woolly aphis attack last season, have been tested again this year. All these seedlings maintained the immunity exhibited during 1929, in spite of continued inoculations made throughout the growing season.

Some hundred new seedlings, raised by the Pomological Section, have been tested to determine their resistance, if any, to woolly aphis attack. However, all the seedlings, including a number of "open pollinated" Northern Spy seedlings proved to be susceptible to attack. A further batch of seedlings is being tested.

Apple Sawfly.

A further attempt to control the Apple Sawfly by means of a post-blossom spray has been continued in the field.

Two sprays, namely, a pyrethrum preparation and an arsenical spray were tested. Neither treatment gave a satisfactory measure of control upon the Apple Sawfly. It would appear that the value of an arsenical spray varies from season to season, since some three years ago encouraging results were obtained with this poisonous spray.

Control of Black Currant Gall Mites.

Big-Bud on Black Currants.

Field spraying trials were commenced this spring to determine whether it is possible to obtain a greater measure of control of big-bud, by means of a post-blossom non-scorching spray, to replace the lime-sulphur wash at present used. The results of this investigation are not yet available.

Gall Mites on Red Currants.

Experiments have been continued on a field scale to test the value of lime-sulphur as a means of control.

It has been established that the mite can be checked by the sulphur-spray provided the spray is applied at the correct season. Some of the more important varieties of red currants are not injured by the treatment.

Systematic Study of Various Acari.

(*a*) *Eriophyidæ.*

A systematic study of this group has been continued and a new sub-species, namely, *Eriophyes Similis Prunianus* Subsp. N. of plum has been described.

(*b*) *Tetranychidæ* and *Tarsonemidæ.*

The above, together with other species of Mites, have been investigated systematically and, from an economic standpoint, with a view to developing methods of control.

Apple Blossom Weevil.

Experiments to test the value of corrugated cardboard bands, and carpet felt bands, as a means of trapping this pest have been carried out in the field.

It has been demonstrated that both these types of traps catch more weevils than the ordinary " sack band " traps. In addition they are easier to manipulate in the orchard.

Two reports have been published during the year.

The Strawberry Tarsonemid.

Some aspects of the life-cycle of this mite have been worked out.

Records of its occurrence in this country show that it is established in many parts of Britain.

Certain varieties of strawberry are more subject to attack than others.

It has been proved by experiment that the mite may cause considerable damage to strawberry plants by feeding on the undeveloped leaflets, causing them to grow in a distorted manner, and producing the typical leaf "crinkle" so common in some varieties.

Preliminary investigations upon the control of this mite have been carried out both in the laboratory and in the field. The more promising treatments, i.e. dipping of plants in lime-sulphur and fumigating the runners before planting, will be tested again next year.

Raspberry and Loganberry Beetle (*Byturus tomentosus*).

Further observations have been made on the life-history of this pest. In a small-scale spraying trial carried out in the summer of 1930 the infestation was considerably reduced in the first four pickings by two sprayings of a new proprietary Pyrethrum extract, but the amount of reduction in the fifth and sixth pickings was insufficient. The proprietary Derris Root preparation used in previous trials without conclusive results was again used and showed considerable promise. Further trials are being planned on a statistical basis. An account of the work to date will appear in the Station's Annual Report, II. Supplement.

Insect Transmisson of Raspberry Mosaic.

This work has been continued. The search for likely insect vectors has been narrowed down by observations on the method of spread of the disease. The possibility of certain insects (notably *Jassidæ*) acting as vectors can probably now be eliminated. An outside infection experiment, not previously feasible, has now been planned.

Other Raspberry Pests.

These have been studied as far as opportunities have permitted.

Capsidæ.

The systematic study of this group has been continued. A winter spraying trial against the Apple Capsid (*Plesiocoris rugicollis* Fall.) has been planned.

PUBLICATIONS DURING THE YEAR.

Steer, W. THE RED PLUM MAGGOT. The Fruit Grower. (January, 1930). **69.** 1779. 83-84.

SUMMARY.

The damage done by the Red Plum Maggot to different varieties of plums, damsons and peaches, and the various known stages of the insect are briefly described. Such facts as are available concerning its habits and life history are reviewed.

It is noted that some of the larvæ pupate under sacking bands tied around the trunks, and it is suggested that these might be killed by ensuring that such bands are soaked by a tar-distillate wash during the customary winter spraying operations.

Attention is drawn to the fact that many larvæ are sent to the markets with the fruit, and it is just possible that some of these may pupate in the returnable baskets and so spread to new areas.

Massee, A. M. THE OCCURRENCE OF A *TARSONEMID* MITE UPON THE CULTIVATED STRAWBERRY IN ENGLAND. Gardeners' Chronicle. (February, 1930) (third series). **87.** 2250, 110-111.

SUMMARY.

The Mite, *Tarsonemus fragariæ* Zimm., is recorded as a pest upon the cultivated strawberry in England for the first time.

Mention is made of the occurrence of this mite in Europe, together with details of damage caused to the plant.

Notes on the habits of the mite are also outlined.

Massee, A. M. THE CONTROL OF THE FRUIT TREE RED SPIDER ON PLUM. East Malling Res. Sta. Ann. Rep. for 1929. (April, 1930). (I.—General) and Journ. of Kent Farmers' Union. (May, 1930), 222-224.

SUMMARY.

(1) It has been shown that wherever tar-distillate washes are used, there is a tendency for the Fruit Tree Red Spider to increase and become a pest of economic importance.

(2) It is pointed out that the tar-distillate washes must still be used in order to destroy other important pests of the plum.

(3) The Fruit Tree Red Spider can be controlled by spraying the plum trees during the growing season, about two weeks after the blossoms have fallen, with a lime-sulphur spray at the rate of one gallon of lime-sulphur to 99 gallons of water.

(4) The lime-sulphur spray does not reduce the crop or cause any spray injury.

(5) White oil emulsion (1 per cent.) and Bordeaux Mixture (8 : 12 : 100) do not control the mite at the strengths used in this experiment.

Massee, A. M. THE APPLE BLOSSOM WEEVIL: THE RESULTS OF FURTHER INVESTIGATIONS UPON ITS CONTROL. East Malling Res. Sta. Ann. Rep. for 1929. (April, 1930). (I.—General) and Journ. of Kent Farmers' Union. (June, 1930). **27.** 182-183.

SUMMARY.

It is shown that corrugated cardboard bands are more successful than " sack bands " for trapping the Apple Blossom Weevil; and that strips of old carpet felt also proved to be superior to the " sack bands " when tested under similar conditions.

In addition it is pointed out that the corrugated cardboard bands are much easier to put on the trees as compared with the " sack bands."

A new method of destroying the weevil whilst hibernating in the sack band is described. It has been found that the weevils can be killed by spraying the bands *in situ* on the trees by means of a 10 per cent. tar-distillate wash.

In addition those weevils hibernating on the trunks immediately beneath the bands are destroyed also.

Finally, the weevils hibernating under the loose bark, and those hiding in the sacking which is placed around the tree trunks, to prevent rubbing and damage by the string, of staked trees are also killed by the winter wash.

Massee, A. M. THE STRAWBERRY RED SPIDER. Gardeners' Chronicle, (April, 1930). **87.** 335.

SUMMARY.

The hibernation period of the strawberry red spider is discussed, and it is shown that most of the mites spend the winter in the adult state, sheltering in the crowns of the plants, amongst dead leaves and in the soil.

Massee, A. M. THE CONTROL OF THE FRUIT TREE RED SPIDER (*OLIGONYCHUS ULMI* C. L. KOCH) OF PLUM DURING THE GROWING SEASON. Journ. of Pom. and Hort. Sci. (May, 1930). **8.** 184-194.

SUMMARY.

It is pointed out that the Fruit Tree Red Spider *Oligonychus ulmi* C. L. Koch is a very serious pest of plum in this country, and that this mite occurs

very commonly in orchards which have been sprayed during the dormant season with a tar-distillate winter wash.

It is further demonstrated that it is essential to continue using the tar-distillate washes in spite of the fact that the Fruit Tree Red Spider is not controlled by these sprays. Other important pests such as the Plum Aphides and the Winter Moth, are controlled as a result of tar-distillate spraying.

That the Fruit Tree Red Spider can be controlled by spraying the plum trees during the growing season, about two weeks after the blossoms have fallen, with a lime-sulphur spray.

That spray should be applied at the rate of one part of lime-sulphur to 99 parts of water.

That the lime-sulphur spray does not reduce the crop, or cause any form of injury to the foliage or fruits.

That White Oil Emulsion (1 per cent.) and Bordeaux Mixture (8 : 12 : 100) are not toxic to the mites at the strengths used.

Massee, A. M. and *Beshir, M.* THE CONTROL OF THE APPLE BLOSSOM WEEVIL. Journ. of Min. of Agric. (May, 1930). 164-171.

SUMMARY.

(1) It is demonstrated that corrugated cardboard bands may be used instead of, and in preference to, " sack bands " for trapping Apple Blossom Weevils.

(2) Strips of carpet felt also proved to be superior to the " sack band " when tested under similar conditions.

(3) A new method of destroying the weevil whilst hibernating in the " sack band " is described.

(4) It is shown that the weevils can be killed by spraying the bands *in situ* on the trees with a 10 per cent. tar-distillate wash.

(5) It is found also that the weevils hibernating on the trunks immediately beneath the bands are destroyed by the wash.

Massee, A. M. A NEW SUB-SPECIES OF ERIOPHYID MITE ON PLUM. Annals and Mag. of Nat. Hist. Ser. 10. (July, 1930). **6.** 145-148.

SUMMARY.

A systematic description of a new sub-species of Gall Mite (*Eriophyes similis prunianus*, Sub-sp. n.) is given. A description of the plum Gall Mite *Eriophyes similis* Nal. is also appended.

Massee, A. M. ON SOME SPECIES OF GALL MITES (*ERIOPHYIDÆ*) FOUND ON *CORYLUS AVELLANA*. L. Bull. Ento. Res. (July, 1930). **21.** 165-168.

SUMMARY.

Systematic descriptions of four species of Nut Gall Mites which occur in this country are given.

An account is also given of the Nut Gall Mite destroying the female flowers and catkins of cultivated nuts.

Massee, A. M. THE RELATIVE VALUE OF TAR-DISTILLATE WASHES, SPRING WASHES AND GREASE-BANDING IN ANY SCHEME OF INSECT CONTROL. Journ. of Kent Farmers' Union. (September, 1930). **28.** 98-104.

SUMMARY.

Among the more important features brought forward in this paper the following are of interest :

A list is given of important insect pests of fruit controlled by tar-distillate washes. The most economic strength of spray to use, and the critical time for applying the wash to various kinds of fruit trees is also discussed.

In addition, the insects not affected by, and those only partly controlled by tar-distillates are reviewed.

It is also emphasised that spring washes must be used in addition to tar-distillates when certain insect pests are present.

Finally, it is explained that grease- banding is still to be recommended in certain cases for the control of March and Winter Moth and also for the control of Apple Capsid in conjunction with a nicotine spray.

Massee, A. M. THE FAUNA OF THE WEEVIL "SACK-BAND."—I. Annals and Mag. of Nat. Hist. Ser. 10. (September, 1930). **6.** 317-320.

SUMMARY.

A list of the commoner insects, mites, etc., noted in the weevil "sack band" traps, together with a few details of other pests found in the bands.

Massee, A. M. THE TARSONEMID MITE OF STRAWBERRY. Journ. of Pom. and Hort. Sci. (December, 1930). **8.** 305-308.

SUMMARY.

In a preliminary experiment healthy Royal Sovereign strawberry plants became diseased and malformed when attacked by the strawberry mite (*Tarsonemus fragariæ* Zimm.).

As a result of mite attack the leaves become crinkled and very brittle. Newly developing leaves turn a silvery-brown colour, and in some instances dry up.

Attacked runners are also malformed and as a result unhealthy plants are produced.

All the " control " (non-infected) plants remained perfectly healthy and produced healthy runners.

THE STRAWBERRY TARSONEMUS.

By A. M. MASSEE.

The Tarsonemid* Mite of Strawberry was recorded for the first time in this country at Truro in Cornwall in 1924. However, it was not considered to be of any importance until 1927, when it was suspected of causing considerable injury to a field of Royal Sovereign strawberry plants growing near Maidstone, Kent.

Since the occurrence of this mite at Maidstone, it has been reported from a great many localities in Great Britain. It has been found in the following counties: Kent, Surrey, Sussex, Devon, Cornwall, Leicestershire, Cambridgeshire, Norfolk, Suffolk, Essex, Warwickshire, Hampshire, Worcestershire, Monmouthshire and Lanarkshire.

This mite is very small in size (much smaller than the familiar red spider of strawberry) and it is only just visible to the naked eye. On account of its small size, combined with its very obscure habits, it is very difficult to find until one is used to looking for it. For example, it is never found on the developed leaves, but during the spring and summer months it lives and feeds in the small, undeveloped leaflets, and it is in such places that the mite must be sought out. It breeds very quickly during the summer months, and at midsummer many thousands of mites are to be found on a single plant. The immature stages and the eggs are also to be found in between the young folded leaflets during the spring and summer months.

This mite, in common with all others in the same group, has a very strong objection to direct sunlight, and it is not found running about the foliage during the daytime. However, it is frequently very active at night, and it is during the period after nightfall that runners attached to the infected parent plant become inoculated with mites. The mites pass from the parent plant along the stolon and start a new colony on the runners. This may happen before the runners are established on their own roots.

From sometime in October until the middle or the end of March (the date varies according to locality and season), the brownish wintering female forms of the mites hibernate in the crowns, or may be found tucked away in other sheltered positions of the plants. They do not feed during the winter months.

* From the Greek, meaning thread-like feet. The fourth pair of legs of the adult female are greatly extended and terminate in a long, tapering thread.

The mites feed continuously during the growing season upon the undeveloped leaflets, the result being that the leaves become very crinkled and grow out in an abnormal manner. The edges of the leaves frequently turn upwards, the margins are also of a paler green colour than the centre, while the texture of the whole leaf is very brittle. Severely attacked plants are often malformed and dwarfed ; some of the younger leaves do not develop at all, but turn brown and dry up before opening. The runners are affected in a similar way.

The varieties Royal Sovereign, Paxton and Laxtonian are known to be very susceptible to attack, while some other well known varieties, i.e., Madame Lefevre would appear to be more resistant.

At present very little definite information can be given regarding control measures, but it has been established that the mites can be checked to some extent by dipping the strawberry runners in a solution of lime-sulphur at the time of planting. The lime-sulphur should be made up at the rate of three parts of lime-sulphur to ninety-seven parts of water. It is advisable to add one pound of " spray gelatine " to each hundred gallons of the lime-sulphur mixture. This ensures a better covering of the leaf by the lime-sulphur.

When treating runners it is not considered necessary to dip the roots.

When the mite is present in established strawberry plantations it is much more difficult to control, and so far no satisfactory measure of control has been discovered. However, some good can be obtained by spraying the plants during the latter part of March or in April with a three per cent. lime-sulphur spray, plus one pound of "spray gelatine " per 100 gallons of made-up wash, the object being to kill the wintering forms when they come out of hibernation, but before they commence to deposit their eggs on the developing foliage.

This treatment will also tend to reduce any red spider that may be present on the plants at this time of the year.

Summary.

A brief account of the occurrence of the Strawberry Tarsonemid Mite in this country is given, together with a list of localities from which it has been recorded up to date.

The symptoms of damage caused by the mite are described, and tentative suggestions for its control are outlined.

THE RELATIVE VALUE OF TAR-DISTILLATE WASHES, SPRING WASHES AND GREASE-BANDING IN ANY SCHEME OF INSECT CONTROL.*

By A. M. MASSEE.

Introduction.

The tar-distillate washes were first used on a commercial scale in Kent during the Winter of 1922-23. Since that time they have become more popular each year, and at present they are used as routine wash by the majority of the Kentish fruit growers.

During the past eight years the writer has had an excellent opportunity of determining the value of tar-distillates when applied on a commercial scale in various parts of the country, and in addition personal tests have been undertaken to determine the behaviour of these Winter washes upon insect eggs both under laboratory and field conditions.

It seems worth while, therefore, to review the position relating to the use of tar-distillates as Winter washes, in order that the merits of these washes may be placed before the grower in a general way.

For this purpose it will be necessary to give detailed lists of those insects (*a*) destroyed, (*b*) partly destroyed, and (*c*) not affected by the tar-distillate washes.

(*A*)—Important Insect Pests of Fruit Controlled by Tar-Distillate Washes.

The following list includes many of the more important pests controlled by tar-distillate washes :—

The Small Ermine Moth	..	*Hyponomeuta malinellus* Zell.
The Permanent Apple Aphid	..	*Aphis pomi* De Geer.
The Rosy Apple Aphid or "Blue Bug"	..	*Anuraphis roseus* Baker.
The Grain and Apple Aphid	..	*Rhopalosiphum prunifoliæ* Fitch.
The Red Leaf Curl Apple Aphid	..	*Anuraphis cratægi* Kalt.
The Vapourer Moth, Apple, Pear, Plum, etc.	..	*Notolophus antiquus* L.

* This paper deals with the use of "Standard" tar-distillates only. The more recently introduced "Modified" and two-solution tar-distillates are not discussed.

Reprinted from the *Journ. Kent Farmers' Union*, 1930, **28.** 98-104.

The Apple Sucker	..	*Psylla mali* Forst.
The Oyster-Shell Scale	..	*Aspidiotus ostreæformis* Curt.
The Apple Mussel Scale	..	*Lepidosaphes ulmi* L.
The Soft Brown Scale of Apple, Plum, etc.	..	*Lecanium capreæ* L.
The Hop-Damson Aphid	..	*Phorodon humuli* Schr.
The Mealy Plum Aphid	..	*Hyalopterus arundinis* Fab.
The Leaf Curling Plum Aphid	..	*Anuraphis helichrysi* Kalt.
The Cherry Black Fly	..	*Myzus cerasi* Fab.
The Currant Leaf Blister Aphid	..	*Amphorophora cosmopolitana* Mason.
The Currant Leaf Tuft Aphid	..	*Myzus lactucæ* Sch.
The Brown Currant Scale	..	*Lecanium persicæ* Fab.
The Hairy Currant Aphid	..	*Capitophorus ribis* L.
The Gooseberry Aphid	..	*Aphis grossulariæ* Kalt.
The Nut Aphid	..	*Capitophorus avellanæ* Sch.
The Raspberry Aphid	..	*Amphorophora rubi* Kalt.
The Leaf Curling Raspberry Aphid		*Aphis idæi* Van De Goot.
The Logan Aphis	..	*Macrosiphum rubiellum* Theo.

It will be seen that the most important pests referred to in the above list are the Rosy Apple Aphid or "Blue Bug," the Hop-Damson Aphid, and the Apple Sucker. These three important pests are completely destroyed by tar-distillates when applied at 5 per cent. In addition, it will be noted that many other important species of Aphids are referred to, while scale insects and hibernating larvæ are also destroyed by these washes.

Although it has been established that a number of important pests are controlled by tar-distillate sprays, it is equally well known that some serious insect pests of fruit are only partially controlled by tar-distillates, even when these washes are applied at the high concentration of ten or twelve per cent. A list of the more important is appended.

(*B*)—Important Insect Pests of Fruit only Partially Controlled by Tar-Distillate Washes.

The Winter Moth	..	*Cheimatobia brumata* L.
The Mottled Umber Moth	..	*Hybernia defoliaria* Clerck.
The Cherry Fruit Moth	..	*Argyresthia nitidella* Fab.
The Woolly Aphid	..	*Eriosoma lanigerum* Hausm.
The Apple Blossom Weevil	..	*Anthonomus pomorum* (L.) Curt.
The Pear Leaf Blister Mite	..	*Eriophyes piri* (Pygst.) Nal.
The Gooseberry Bryobia ("Red Spider")	..	*Bryobia nobilis* Th.

Although it is known that not more than about 70 per cent. of the eggs of Winter Moth and Mottled Umber Moth are destroyed by tar-distillate washes applied at a 10 per cent. concentration, this phenomenon has not been explained in a satisfactory manner so far.

It is also curious that the Cherry Fruit Moth, the Woolly Aphid of Apple, and the Pear Leaf Blister Mite which occur on the trees during Winter as young larvæ, in the form of Aphids and adult mites respectively, should not be wiped out by using these Winter washes, but in practice (however efficiently the spraying is done) sufficient individuals generally survive to start a fresh colony the following Spring.

The Apple Blossom Weevil and the Gooseberry Bryobia both hibernate on the tree in adult stage during the Winter. These insects are killed by the Winter wash. However, it must be remembered that many weevils and gooseberry mites hibernate in the soil, amongst dead leaves, and in cracks in old fence posts, and these return in the Spring months and re-infest the trees.

It is evident that many growers have been of the opinion that when a tar-distillate wash has been thoroughly applied to an orchard most of the insect pests are destroyed, and there remains very little to worry about in the following Spring.

Unfortunately this impression has proved to be quite wrong. Many species of insect pests are not affected by tar-distillate washes. They may be tabulated under the following heads :—

(*C*)—Important Insect Pests not Controlled by Tar-Distillate Washes.

(1) *Hibernating on the Tree.*

The Plum Leaf Hopper (egg)	..	*Typhlocyba quercus* Fab.
The Plum Leaf Hopper (egg)	..	*Zygina coryli* Collin.
The Apple Leaf Hopper (egg)	..	*Typhlocyba* sp.
The Nut Leaf Hopper (egg)	..	*Typhlocyba* sp.
The Red Plum Maggot (larvæ)	..	*Opadia funebrana* Tr.
The Black Currant Gall Mite (all stages in buds)	..	*Eriophyes ribis* (Westw.) Nal.
The Apple and Plum Case Bearer (larvæ in case)	..	*Coleophora nigricella* Stgch.
The Apple Case Bearer (larvæ in case)	..	*Coleophora* sp.
The Lackey Moth (egg band)	..	*Malacosoma neustria* L.
The Fruit Tree Red Spider (egg)		*Oligonychus ulmi* C. L. Koch.
The Codlin Moth (larvæ in rough cocoon)	..	*Cydia pomonella* L.
The Tortrix Moth (egg)	..	*Tortrix podana* Sc.

The Tortrix Moth (egg) . .	*Tortrix ribeana* Hb.
The Tortrix Moth (egg) . .	*Tortrix rosana* L.
The Bud Moth (larvæ in case or cocoon) . .	*Hedya ocellana* Fab.
The Apple Capsid (egg) . .	*Plesiocoris rugicollis* Fall.
The Currant Capsid (egg) . .	*Lygus pabulinus* L.
The Nut Gall Mite (all stages in buds)	*Eriophyes avellanæ* Nal.

(2) *Wood-Boring Insects.*

The Pith Moth (larvæ in spurs) . .	*Blastodacna atra* Haw.
The Apple Clearwing (larvæ in shoots) . .	*Aegeria myopiformis* Bork.
The Currant Clearwing (larvæ in shoots) . .	*Aegeria tipuliformis* Cler.
The Wood Leopard Moth (larvæ in stems) . .	*Zeuzera pyrina* L.
The Goat Moth (larvæ in trunks) . .	*Cossus cossus* L.
Shot Hole Borer of Plums (larvæ and adults in stems) . .	*Xyleborus dispar* Fab.

(3) *Hibernating in Soil under Tree or Bush* (as larvæ, adult, or pupa).

The March Moth . .	*Anisopteryx aescularia* L.
The Apple Fruit Sawfly . .	*Hoplocampa testudinea* Cam.
The Pear Midge . .	*Contarinia pyrivora* (Riley).
The Brown Leaf Eating Weevil . .	*Phyllobius oblongus* L.
The Green Leaf Eating Weevil . .	*Phyllobius maculicornis* Germ.
The Plum Fruit Sawfly . .	*Hoplocampa fulvicornis* Klug.
The Currant and Gooseberry Sawfly . .	*Nematus ribesii* Cam.
The Nut Weevil . .	*Balaninus nucum* L.
The Pear and Cherry Slugworm . .	*Eriocampa limicina* De Geer.
The Raspberry and Logan Beetle	*Byturus tomentosus* Fab.

(4) *Hibernating as Adult in Sheds, Stacks, etc.*

The Apple Leaf Skeletonizer . .	*Hemerophila pariana* Clerck.

The insects not destroyed by tar-distillate washes are divided into four groups for convenience.

In the first group—insects hibernating on the tree—it will be noted that most of these insects occur in the egg stage during the Winter, and few are found as larvæ protected in most cases by a cocoon or case, while the remainder are actually inside the buds.

Theobald found that the standard tar-distillates give some measure of control upon the Apple Capsid Bug, but it is not considered that these washes are of any commercial value as a means of controlling this pest.

It will be understood that the insects referred to in the second group—wood-boring insects—are actually tunnelling in the stems and branches, and these pests cannot be reached by the tar-distillate sprays. Nevertheless they are present and must be treated by other means than tar-distillates.

The third group, namely, insects hibernating in soil as larvæ under the tree or bush, is probably the most important of all. It used to be thought that a thorough dressing of the soil with a tar-distillate was sufficient to destroy these wintering larvæ. This idea has proved to be erroneous, since most of these insects have been increasing during the past two or three years. This increase is doubtless due to the annual application of tar-distillate, and at the same time the lack of nicotine and lead arsenate as pre- and post-blossom sprays in the Spring. The same applies to the insect referred to under heading four. A few years ago the Apple Leaf Skeletonizer was almost unheard of as an apple pest. In certain parts of Kent it is now a very common insect and causes a good deal of damage to apple foliage. After spending the Winter as a moth, eggs are laid on the leaves during June, the larvæ hatch and commence to defoliate the trees. In the old days this pest was controlled by the routine Lead Arsenate sprays which were applied each year. Since tar washes have been introduced Spring spraying has not been carried out systematically, one of the results being an epidemic of Apple Leaf Skeletonizer.

It has been shown that tar-distillates destroy some injurious insects, while others are not affected by these sprays. In addition some beneficial insects which hibernate on the trees are destroyed as the direct result of tar-distillate spraying. The most important are the following :—The Red Spider Predator (*Anthocoris nemorum* L.), the Two Spot Lady-Bird Beetle (*Adalia bipunctata* L.), the Seven Spot Lady-Bird Beetle (*Coccinella 7-punctata* L.), the Beetle Mite (*Euzetes lapidarius* Mic.), and several beetles which hibernate under the loose bark, and are considered to play an important part in the pollinating of the flowers during the blossom period. These minute beetles do not possess popular names, but their scientific names will be given for reference purposes :—*Micrambe vini* Panz., *Atomaria linearis* Steph., *Melanophthalma gibbosa* Hbst., *Corticaria elongata* Gyll., and *Meligethes aeneus* F.

The most Economic Strength of Tar-Distillate Wash to apply to Fruit Trees.

When discussing tar-distillate washes growers frequently ask what is the best strength to use in their orchards. Naturally this depends upon the variety of tree to be sprayed. For instance, plums, gooseberries, currants, nuts and

raspberries should be sprayed at a strength not exceeding 6 per cent. At this strength all the species of green-fly which occur on the trees and bushes will be destroyed and in addition various species of scale insects will be killed also.

When spraying apples the position must be viewed from a different standpoint. For instance, one should be able to state whether Winter Moth and March Moth occur each year as troublesome pests. On farms where these two pests occur each year it is very little use spraying with a ten per cent. tar-distillate, and hoping for the best. It has been shown already that the eggs of the Winter Moth are not wholly destroyed by tar-distillate washes when applied at 10 per cent., and, of course, the March Moth does not lay her eggs on the twigs and branches until the Winter spraying season is over. Where these two pests occur it is considered much better to spray the trees in Winter (February if possible) with a six per cent. tar-distillate to ensure the destruction of Apple Sucker and "Blue Bug," and to rely on grease-banding or Spring washing for the control of caterpillar.

In the Spring of 1930 many growers were compelled to spray with lead in order to destroy March Moth and Winter Caterpillar. Many of these growers had sprayed previously with a 10 per cent. tar-distillate. Had they sprayed with a 6 per cent. concentration, the total cost per acre would have been reduced considerably and the same results would have been obtained.

Time of Application.

Another important factor in relation to tar-distillate spraying is the time of application.

Where nuts are grown the spraying must be completed by the first week of December, otherwise the flowers which appear later on will be destroyed. A 5 per cent. solution is sufficient for nuts.

Plums.

The worst pests of plum, namely, the various species of aphids or green-fly, deposit their eggs on the twigs and shoots during October or at the latest by the end of November. These trees may be sprayed safely during December. A 6 per cent. solution is sufficient for plums.

Apples.

There appears to be no reason (except possibly weather conditions) why apples should be sprayed before Christmas, and where it is proposed to obtain a partial control of caterpillar by using a 10 per cent. solution, it is wise to spray at the last possible moment. February is the ideal month for spraying apples if weather conditions permit. A 6 per cent. solution which controls Apple Sucker and all species of Aphids and scale insects is sufficient for apples.

Soft Fruits.

Red, white and black currants, gooseberries, loganberries and raspberries can be sprayed at any period from the end of November until March. A 5 per cent. solution is the ideal strength for these soft fruits.

Some growers spray their strawberries with a 5 per cent. tar-distillate, and providing the wash does not lie about in pools around the plants, no damage will result.

Where strawberries are grown under top fruits it is fatal to drench the top fruits with a 10 per cent. tar-distillate, since sufficient spray drips off the trees to damage or kill the plants under them.

Spray Injury.

Although it is well known that the tar-distillate sprays must be applied in the dormant season only, it is not always realised that certain kinds of fruits and still further certain varieties can be sprayed only at a limited period.

For example, it has been shown already that nuts must be sprayed during the latter part of November or in the first week of December to avoid damaging the flower, which appears soon after Christmas. Again plums must be sprayed during December or in January. When sprayed in February (even at 5 per cent.) damage to the buds often results.

At least two varieties of apples, namely, Newton Wonder and Beauty of Bath are susceptible to spray injury, and these varieties must be washed as soon after Christmas as possible to avoid bud injury. The last week in February is considered the latest date for spraying these varieties.

Two varieties of red currants, Fay's Prolific and Raby Castle, are known to be affected by high concentrations of tar-distillate. A 6 per cent. solution is the maximum that can be used with safety.

Efficient Spraying.

To obtain the best results with tar-distillates it must be borne in mind that the method of application is the real secret of success. The spray must be applied well, at a pressure of not less than 150 lbs. to the square inch, and care must be taken to ensure that every part of the tree is covered by the spray. It is necessary to spray the trunk of the trees very thoroughly since some eggs (the eggs of the Blue Bug) are frequently deposited in crevices on the trunk.

Further, it is necessary to wash out the steel pipes each night so that they do not become corroded by the wash. The pipes becoming corroded results in the spray nozzles getting blocked up, which causes considerable delay.

When finishing at night it is advisable to shift the pipes to the new setting. This ensures the pipes being emptied and enables the spraying gang to get an early start the following day.

The Necessity of Grease-Banding.

The fact that cherry trees can be sprayed with these washes for the control of Cherry Black Fly is a great step forward, and where this pest is found on young trees a 5 per cent. tar-distillate is to be recommended. However, in old-established orchards where the trees are very large it is not always a commercial proposition to spray them with a Winter wash. In such cases grease-bands may be used with advantage. The grease-bands should be put on the trees by the first week of October. While it is true that the grease-bands will not affect the Cherry Black Fly, they will materially reduce the number of leaf-eating caterpillars which frequently occur on cherry trees. Grease-bands are also required where Apple Capsid abounds. During the course of nicotine spraying in the Spring for capsid control a good many of the young stages of the capsids are knocked off the trees. These would normally return to the trees by the way of the trunk were it not for the band of grease which prevents them from doing so.

Spring Washes.

A few years ago both nicotine and arsenate of lead sprays were used very extensively by fruit growers during the Spring months. Since the introduction of tar-distillate washes there has been a tendency to reduce the number of Spring applications of insecticides, and indeed many growers do not apply Spring washes at all. The result is interesting, but not less alarming. Many fruit pests, for example, the Apple Fruit Sawfly, the Plum Sawfly, the Codlin Moth, the Red Plum Maggot, the Apple Leaf Skeletonizer, and indeed numerous other insects which have not previously been considered as important pests in this county, are increasing year by year, in many parts of the county, and the time has come when these must be controlled. Therefore it is suggested that lead, and in some cases nicotine, should be applied in the Spring as pre- and post-blossom sprays. In practice, these can usually be mixed with the Scab control spray, though it would be more ideal to apply them separately.

It has been pointed out already that the March Moth comes too late to be controlled by a tar-distillate spray (and it must be emphasised that this pest is now very common in some parts of Kent) that the Winter Moth is not completely checked, therefore it is imperative to apply a lead arsenate spray in the Spring. The time of application of a lead arsenate spray is very important. Many growers apply the first pre-blossom application too late. The first week

of April is usually the ideal date for putting on the first lead spray. The spraying should be repeated ten days later if necessary. Where Red Spider occurs the use of lime-sulphur must be resorted to in the Spring months. Lime-sulphur can be applied as a pre- and post-blossom spray.

Destruction of Pollinating Insects.

During the flowering season of apples this year the writer has had the opportunity of comparing the number of insects present on sprayed and unsprayed trees. The sprayed trees had received 10 per cent. application of tar-distillate for the last three years, while the unsprayed trees had not received treatment of any sort since the war. The idea of this survey was to determine whether more insects of a beneficial nature were to be found on the unsprayed and neglected trees than those sprayed with a tar-distillate wash.

In this connection it is interesting to note that a large number of small beetles were found in the flowers of the unsprayed trees. Very few, if any, of these beetles were present on the sprayed trees. The Red Spider predator (*Anthocoris nemorum* L.) also occurred in greater numbers on the unsprayed trees, and only odd specimens of the mite could be found on the leaves, whereas the sprayed trees were badly infected with mites and their eggs. Beneficial Capsids, Lace-wing Flies, and Beetle Mites were also present on the untreated trees. These insects were not present on the sprayed trees. A full list of the insect fauna of sprayed and unsprayed trees is being prepared. This will be published elsewhere.

Finally, in view of the increase of the Fruit Tree Red Spider (one of the direct results of tar-distillate spraying) growers are asking whether the increase is more prevalent in orchards sprayed with a 10 per cent. concentration as compared with orchards sprayed with a 5 per cent. tar-distillate.

Unfortunately this is not so. A 5 per cent. tar-distillate drives away as many natural enemies of the Fruit Tree Red Spider as a 10 per cent. tar wash, and in each case the red spiders breed without check the following Spring.

Conclusions.

The information contained in this paper is intended to present briefly the number of injurious insect pests which can be controlled by tar-distillate washes. The most economical strength of spray used and the critical time for applying the wash to various kinds of fruit is also discussed.

In addition, the insects not affected by these washes and those only partly controlled by tar-distillates are reviewed.

It is also emphasized that Spring washes, namely nicotine and soft soap, lead arsenate and lime-sulphur, must be used in addition to tar-distillates when

certain insect pests are present in a particular orchard. For example, the March Moth, the Winter Moth, the Fruit Tree Red Spider, the Apple and Plum Sawflies and the Case Bearers cannot be controlled during the Winter months, and at present the Spring washes must be relied upon for this purpose.

Finally it has been explained that grease-banding is still to be recommended in certain cases for the control of March and Winter Moth and also for the control of Apple Capsid in conjunction with a nicotine spray.

Part VI

Hops

Part VI

HOPS

By F. H. BEARD.

Cultural Trials.

The new Training and Distance Trial has had the crop recorded for the first time. The variations in the yield per acre due to the different distances apart of the hills have proved significant. The effect of the numbers of bines trained up each string has not been apparent this season, due, probably, to the fact that the hills are not yet fully established and consequently all were rather short of bine.

New Seedlings.

Many of Professor Salmon's earlier seedlings which have had crop records and resin analyses taken over a period of several years and have proved not worthy of retention have been grubbed, their place being taken by new seedlings of greater promise.

Brewing trials are being continued with the most promising new varieties. Of the early varieties, six seedlings cropped at the rate of over a ton to the acre, and three proved richer than the Bramling. Among the mid-season hops, twelve yielded over a ton per acre, and six were richer than the highest commercial variety (Fuggles). In the late hops, thirty-six cropped at the rate of a ton per acre or over, and fourteen exceeded the richest commercial variety (Canterbury Golding).

Two New Varieties proved of greater preservative value than the richest hops obtainable in 1929; one of these (C9a) also exceeded the richest hops in 1928.

Incidence and Control of Downy Mildew.

The attack of the "spike" form of the disease in the spring and early summer was less severe than in the two previous seasons.

No "spikes" were found after the end of June compared with June 6th in 1929, and July 10th in 1928.

At the time of picking, many of the New Varieties that had not been sprayed with Bordeaux Mixture were attacked on the cones, some so severely that the crop was not picked. None of the commercial varieties were seriously attacked on the cones.

The seedling variety Y90 was sprayed with Bordeaux Mixture five times when in burr to injure the " brush " and so obtain seedless hops, and was entirely free from Downy Mildew on the cones, whilst the cones of the unsprayed hills of the same variety were completely destroyed by the disease.

PUBLICATION DURING THE YEAR.

Salmon, Prof. E. S. THIRTEENTH REPORT ON THE TRIAL OF NEW VARIETIES OF HOPS AT EAST MALLING. East Malling Research Station, Kent. (August, 1930.)

Summary.

(1) Of the 130 varieties (New and Commercial) tested, fifty-four cropped at the rate of 20 cwts. to the acre or over.

(2) The number of bushels (Imperial) of green hops required to the cwt. of dried hops varied in the New Varieties from 77 to 128, and in the Commercial Varieties from 68 to 129.

(3) In all the classes (Early, Midseason and Late Varieties) certain New Varieties proved on analysis to be richer in preservative qualities than any of the Commercial Varieties.

(4) Two New Varieties (raised from a " wild " hop from Manitoba, Canada) were richer in preservative qualities by 0.83 and 0.13 per cent., respectively, than the richest sample of American hops obtainable.

(5) Notes are given on the incidence of " Mosaic " disease and Downy Mildew.

(6) Experiments with the seedling variety Y90 have shown that spraying when in " burr " with Bordeaux Mixture does not hinder the production of normally developed cones.

* Report issued from East Malling by Prof. E. S. Salmon, South-Eastern Agricultural College, Wye, on data collected jointly upon Hops grown at East Malling.

Part VII

Meteorological Observations

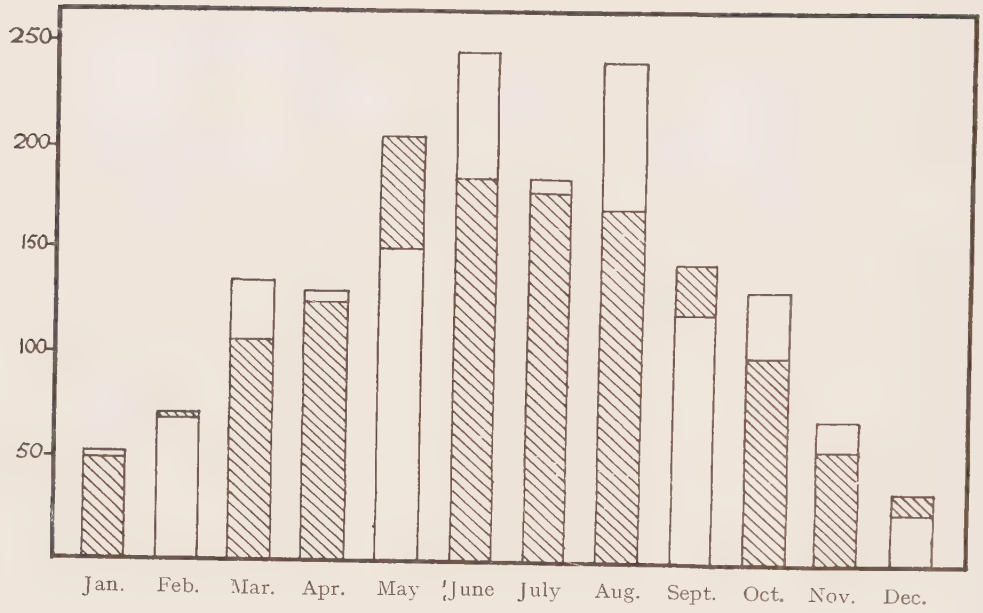
Part VII

WEATHER CONDITIONS DURING 1930.

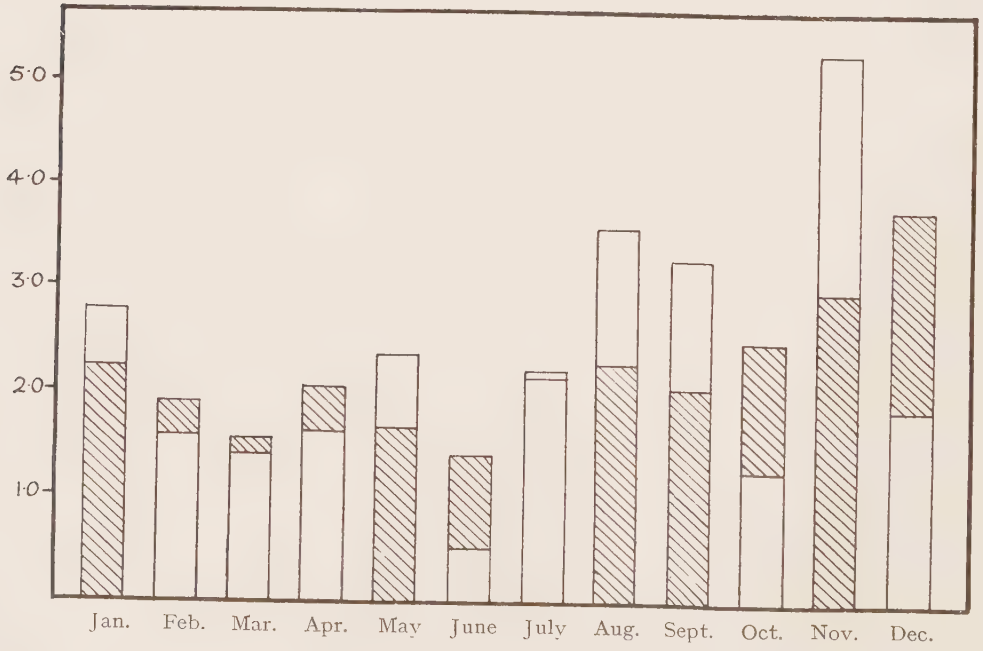
By. H. C. CHAPELOW and H. M. TYDEMAN.

Looked at from the point of view of the horticulturist, the weather conditions experienced during 1930 may be said to have been extremely satisfactory. A fairly normal Spring without unduly severe or prolonged frosts was followed by a somewhat dull and wet Summer. Good crops of all varieties of fruits were obtained, and harvesting was possible under passably good conditions. Temperatures followed an extremely normal course throughout the year, significant departures from the mean not having occurred. Rainfall amounted to 27.600 inches. August, September and November were notably wet months, while June, October and December were dry. Sunshine totalled 1,562 hours, about one hundred hours in excess of the average for this district. June and August were outstandingly sunny, while May, usually a sunny month here, was considerably deficient.

TOTAL SUNSHINE IN HOURS.



TOTAL RAINFALL IN INCHES.



Diagrams showing Total Sunshine and Rainfall during 1930 as compared with previous 16 years average. Shaded portion 16 years average.

SUMMARY OF METEOROLOGICAL OBSERVATIONS DURING 1930.

	Barometer.	Temperature in Screen.					On Grass.		No. of Frosts.	Rainfall.				Sunshine.			Hygrometers.		Wind.
	Mean Reading.	Mean maximum.	Mean minimum.	Highest.	Lowest.	Mean.	Mean.	Lowest.		Total (in ins.)	No. of days.	Av. per rainy day.	Heaviest fall in any one day.	Total hours.	No. of days.	Av. per sunny day.	Mean of dry bulb.	Av. deprec. of wet bulb.	Direction.
January ..	29.769	48.4	37.2	57	27	39.8	31.8	20	12	2.82	20	0.14	0.39	49.9	21	2.3	42.5	1.2	S and SSW
February ..	29.990	42.0	33.2	50	28	37.6	28.2	17	20	1.610	11	0.146	0.555	68.0	24	2.8	37.0	1.4	NNE
March ..	29.794	49.4	35.6	58	27	42.5	29.1	17	19	1.415	12	0.118	0.42	134.3	30	4.47	42.1	2.1	W and SSW
April ..	29.724	53.9	39.3	68	31	46.6	33.5	21	12	1.280	14	0.091	0.375	130.2	27	4.8	48.2	2.3	NNE and SSE
May ..	29.888	60.6	44.2	71	33	52.4	39.6	28	3	2.325	16	0.145	0.83	152.2	28	5.4	53.3	3.0	NNE
June ..	29.967	69.2	49.7	81	35	59.4	45.7	29	1	0.505	4	0.126	0.36	245.6	30	8.2	62.4	4.9	SW
July ..	29.792	65.6	52.0	81	42	58.8	46.4	33	0	2.160	11	0.196	0.80	186.9	31	6.0	62.3	5.1	NNW and SW
August ..	29.840	70.6	53.6	89	44	62.1	48.3	38	0	3.64	16	0.23	1.12	242.7	31	7.8	63.3	4.9	SSW and WNW
September ..	29.862	65.2	49.6	78	39	57.4	45.4	33	0	3.30	18	0.18	0.68	121.4	25	4.8	58.5	2.4	SW and SSW
October ..	29.818	58.8	44.1	67	31	51.4	37.8	21	6	1.32	11	0.12	0.27	133.9	29	4.6	53.3	2.6	W and SW
November ..	29.828	50.1	37.0	58	21	43.5	32.5	12	11	5.310	19	0.28	0.82	69.4	21	3.3	44.8	1.8	WSW
December ..	29.842	45.0	33.8	52	27	39.4	33.0	11	17	1.920	14	0.137	0.41	27.3	10	2.7	39.1	0.9	SSW and WSW

For Complete List of Members see pp. 141-162.

THIS LIST REFERS TO NEW MEMBERS AND ANNUAL SUBSCRIBERS DURING THE YEAR.

1st January, 1930, to 31st December, 1930

* Denotes *Life* member as distinct from *Annual* member.
† Denotes *Life* member and *Annual* Subscriber.
‡ Denotes *Life* Founder and *Annual* Subscriber in other Group.

Group A.—"Founders."

†Chivers & Sons, Ltd. ..	Estate Office, Histon, Cambridge.
*Faulkner, J. ..	"Maribel" Fairseat, Wrotham, Kent.
*Guinness, Rt. Hon. Walter, D.S.O., M.P. ..	10 Grosvenor Place, London, S.W.1.
*Hudson, W. S. ..	Park Gate Farm, Tenterden, Kent.
*Imperial Chemical Industries, Ltd. ..	Millbank, London, S.W.1.
*Kitchin, J. ..	Boughton Place, Sandway, near Maidstone, Kent.
Norfolk County Council ..	The Shirehouse, Norwich, Norfolk.
*Perree, J. A. ..	Oaklands, St. Saviours, Jersey.
*States Committee of Agriculture ..	Greffe Office, St. Helier, Jersey.
*United Potash Co., Ltd. ..	Fenton House, 112 Fenchurch Street, London, E.C.3.
†Wolmer, Lord ..	Blackmoor, Liss, Hampshire.

Group B.—"Fellows."

Barton, J. L. ..	Broadwater, East Malling, Kent.
Bennett, H. E. ..	Ditton Court Farm, Larkfield, Kent.
Bromley, Warner-, N. B.	Finsbury House, Blomfield Street, London, E.C.2.
Buxton, A. F. ..	Fairhill, Tonbridge, Kent.
Columbo Commercial Co., Ltd. ..	(The Secretary), Queen Street Place, London, E.C.4.
Essex, Sir R. Walter, I.P.	Dixcot, North Drive, Streatham, S.W.16.
*Favell, C. R. ..	Crundall's Fruit Farm, Matfield, Kent.
*Haviland, Dr. F. ..	Branksome House, St. Leonards, Sussex.
†Hillier & Sons ..	Nurserymen, West Hill Nurseries, Winchester, Hampshire.
Isle of Ely Education Committee ..	Education Offices, March.
Linden, Van der H. ..	Carbo-Krimp Co., Ltd., St. Mary's Chambers, 161a Strand, London, W.C.2.
Mann, W. E. ..	Carnuirs, Soham, Cambs.

Morgan, R. C.	..	Little Whatmans, Biddenden, Kent.
Murphy & Son, Ltd.	..	Wheathampstead, Herts.
Ogilvie, G. N.	..	Cox's, Harpenden, Herts.
Robbins, A. J.	..	Vicarage Farm, Hounslow, Middlesex.
Tickler, T. G., Ltd.	..	The Fruit Farms, Bradley, near Grimsby, Lincs.
West, Samuel	..	Ewhurst Place, Hawkhurst, Kent.

Group C.—"Associates."

Alexander, W.	..	Home Farm, Eynsford, Kent.
Amos, A.	..	Spring Grove Farm, Wye, Kent.
Amos, Miss M.	..	Beyton Cottage, near Bury St. Edmunds, Suffolk.
Ascherson, C. S.	..	15 Phillimore Gardens, London, W.3.
Aspland, A. Lees	..	"Kalgan," Welwyn, Herts.
Attrell, E. S.	..	Warren Fruit Farm, North Common, Chailey, Sussex.
Baiss, R. S. H.	..	Church House, Beckley, Sussex.
Barnes, W.	..	Southfield, Cooden, near Bexhill, Sussex.
Batt, Lt.-Col. R. B., C.B.S., M.V.O.	..	Gresham Hall, Gresham, Norwich, Norfolk.
Batten, S. D.	..	Countessmead, Tiverton, Devon.
Bear, E. M.	..	Fruit Farm, Magham Down, Hailsham, Sussex.
Belcher, W. S.	..	Church Farm, Waltham St. Lawrence, Twyford, Reading, Berks.
Bennett, Major J. Sterndale		Oaken Wood, Wateringbury, Kent.
Bennion, C. F.	..	Curly Dip, Budleigh Salterton, Devon.
Berry, H. A.	..	Iverley, near Stourbridge, Worcestershire.
Bevington, Mrs. M.	..	Wybournes, Kemsing, near Sevenoaks, Kent.
Blakeman, A. J.	..	The Schools, Bowdon, Cheshire.
Bligh, E. R.	..	Goddard's Green Farm, Benenden, Kent.
Boddington, F.	..	The Manor Fruit Farm, Burghill, Hereford.
Borthwick, The Hon. Wm.		14 Wilton Crescent, London, S.W.1.
Bowring, A.	..	The Oaks, Goudhurst, Kent.
Bracher, H. C.	..	Place Farm, Ryarsh, Kent.
Bray, W. & Sons	..	Dartmoor Nurseries, Okehampton, Devon.
Brook, P. T. S.	..	Broad Oak Farm, Sturry, Canterbury, Kent.
Burrell, R. J.	..	Risby Place, Bury St. Edmunds, Suffolk.
Carles, Miss H. M.,	..	c/o G. H. Lupton, Esq., Elgin C.P., South Africa.
Carter & Blewitt, Ltd.	..	Fruit Growers and Nurserymen, Boxted, Colchester, Essex.
Chambers, Rev. F.	..	Lested Lodge, Chart Sutton, Kent.
Champneys, H. O.	..	The Grange, Lamberhurst, Kent.
Chapman, Mrs. E. G.	..	Kuling, Winscombe, Somerset.
Church, King-, L. A.	..	Northfield, Albury, near Guildford, Surrey.
Clarke, Baron B. H.	..	Hasketon Hall, Woodbridge, Suffolk.
Clark-Pearce, Mrs. Lylie		The Grey House, Sevenoaks, Kent.
Clayton, Collins	..	26 Market Place, Wisbech, Cambridge.
Connew, T. F.	..	St. Ronan's, Kingstonridge, near Lewes, Sussex.
Conway, Lady	..	Allington Castle, Maidstone, Kent.

†Cook, L. Morton ..	"Campsie," Shoreham-by-Sea, Sussex.
Cornwell, B. ..	Iona, Gore Court, Tunstall Road, Sittingbourne, Kent.
Cracknell, Miss ..	School of Nature Study and Gardening, Clapham, near Worthing, Sussex.
Cubitt, E. G. ..	Honing Fruit Farms, Honing, Worstead, Norwich.
Cutbush, W. & Son, Ltd.	The Nurseries, Barnet, Herts.
Dahl, C. G. ..	Alnarps Tradgardsskola, Akarp, Sweden.
Danreuther, W. ..	Battle Fruit Farm, Battle, Sussex.
Davies, Rev. W. A. ..	Bwlchgwyn Vicarage, Wrexham, Denbigh.
Day, S. ..	Paris Farm, East Malling, Kent.
Densham, S. C. ..	Little Hickmotts, Marden, Kent.
Desboeux, H. A. ..	Battramsley Close, near Lymington, Hampshire.
Dixon, T. & M. ..	Tardebigge, Bromsgrove, Worcester.
Elgar, N. E. B. ..	Stallance, Sutton Valence, Maidstone, Kent.
Esbjerg, Niels ..	Forsogsledor, Forsogsstationen, Blangsted pr. Odense, Denmark.
Everett, Major R. C. ..	Castelmer, Kingston, Lewes, Sussex.
Fillmer, Miss S. ..	Oakfield, Hassocks, Sussex.
Findlay Bros. ..	Springhill Nursery, Baillieston, near Glasgow, Lanarkshire.
Firkins, A. R. & G. W. ..	The Moor, Eardiston, Tenbury, Worcester.
Forbes Renny & Co., Ltd.	Alperton, Wembley, Middlesex.
French, J. Hillier ..	9 King Street, Maidstone, Kent.
Fryer, P. J. ..	Messrs. Wm. Cooper & Nephews (Aus.), Ltd., 4 O'Connell Street, Sydney, Australia.
Gale, A. W. ..	Ivyside, Marlborough, Wilts.
Gamble, Oswald ..	Dunedin, Mark Cross, near Tunbridge Wells, Kent.
†Gill, Major J. H. ..	Foxglove, Willesborough, near Ashford, Kent.
Goodhew, L. J. ..	8 East Street, Sittingbourne, Kent.
Goodson, S. G. ..	Frognall, Wickhambreaux, Canterbury, Kent.
Gooiland Nurseries (G. Wesseling & Co.)	Naarden, Holland.
Gordon, Col. W. A. ..	Warwick Farm, Mulders Vlei, Cape Province, S. Africa.
Gracie, A. B. ..	Bigbury House, Harbledown, Canterbury, Kent.
Granger, H. ..	The Maldon Fruit & Poultry Farm, Maldon, Essex.
Greenfield, G. J. D. ..	"Donromyn," Oakdale Road, Carlton, Nottingham.
Grey, Countess Mabel ..	Howick Alnwick, Northumberland.
Groom, H. C. & Co. ..	Bellevue Farm, Guilden Sutton, Chester.
Gwynne, H. A. ..	Mawbyns, Little Easton, Dunmow, Essex.
Gwynne, Rev. R. L. ..	Little Easton Rectory, Dunmow, Essex.
Hall, F. V. ..	The Pomona Garden Co., New North Road, Exeter, Devon.
Harraway, T. H. & Son ..	The Nurseries, Warminster, Wilts.
Hartley Agricultural Co-operative Society, Ltd.	Hartley, Longfield, Kent.
Have, Van der A. ..	Kapelle, Bij Goes, Holland.
Head, W. ..	Government Botanic Gardens, Saharanpur, United Provinces, India.
Heyst, Van B. G. ..	83 Mauritsstraat, Utrecht, Holland.

Hollands, W. T. ..	Court Lodge, West Malling, Kent.
Hopwood, W. & Son ..	58 High Street, Cheltenham, Gloucester.
Hubsch, Schmitz H. ..	Merten, Kreis Bonn, Rhld, Germany.
Hubsch, Schmitz Otto ..	Merten, Kreis Bonn, Rhld, Germany.
Huxley, Henry ..	Wootton Close, Boars Hill, near Oxford.
Hynard, F. C. ..	Lower Austin Farm, Eynsford, Kent.
Jongh Ltd., Wed P. De ..	Nurserymen, Goes, Holland.
Keeble, F. ..	Brantham Lodge, Manningtree, Essex.
Kenyon, G. H. ..	Ricklesmere, Kirdford, near Billingshurst, Sussex.
Kingsley Fruit Farm and Nursery	Kingsley, Bordon, Hants.
Kirkhope, W. G. ..	Felmere, Felbridge, East Grinstead, Sussex.
Kroon, P. ..	Sappemeer, Holland.
Lacey, G. H. ..	Warmley, near Bristol.
Lamont, J. C. ..	Gedges Hill, Matfield, Kent.
Landale, Capt. H. R. ..	Ewell Manor, West Farleigh, Kent.
Langrish & Chalcraft ..	Wheatley, near Bordon, Hampshire.
Lees, Herbert ..	Holmefields, Tenbury Wells, Worcestershire.
Lewis, N. S. ..	Mumford, Wittersham, Kent.
Locket, Wood-, Dr. T. (late)	New Holme, Bratton, Westbury, Wilts.
Luck, Col. B. J. M. ..	The Hermitage, West Malling, Kent.
Machin, N. F. ..	Red Hill Farm, Wateringbury, Kent.
MacFarlan, Lt.-Col. J. B.	Invermay, Knowle, Budleigh Salterton, Devon.
Marten, Sir Amberson ..	Gedges, Matfield, Paddock Wood, Kent.
Mathiesens Planteskole ..	Korsør, Denmark.
Matthews, F. P. ..	The Nurseries, Harlington, Hayes, Middlesex.
McLysaght, E. ..	Hazelwood, Mallow, Co. Cork, Irish Free State.
Miles, W. & Co., Ltd. ..	16 Church Road, Hove, Sussex.
Mitchell, W. H. ..	Orchard House, Westwick, Norwich, Norfolk.
Monins, J. E. ..	Ringwould, near Dover, Kent.
Moore, F. W. & Co., Ltd...	Clarence House, 8 Arthur Street, London, E.C.4.
Mount Barker Fruitgrowers' Co-operative Society, Ltd. (Secretary, A. T. Booth) ..	Mount Barker, Western Australia.
Murton, E. ..	Langton, Hawksdown, Walmer, Kent.
*Napier, J. R. H. ..	Little Slifehurst Farm, Kirdford, Sussex.
Noble, Major ..	Mayfield, Kingswood Road, Shortlands, Kent.
Norbury, F. P. ..	Sherridge, near Malvern, Worcester.
Norfolk East Fruit Growers' Association	Wroxham, Norfolk.
†Norton, Capt. R. A. ..	Downs House, Yalding, Kent.
Nume, B. ..	Rackham Cottage, Greatham, Pulborough, Sussex.
O'Brien, H. V. ..	Monare, Foynes Island, Limerick, Irish Free State.

Padwick, H. F. ..	The Red House, West Ashling, Chichester, Sussex.
Peet, H. F. ..	Glenbrook, Delgany, Co. Wicklow.
Pewtress, The Misses M. A. and D. H. ..	Fruit Growers, Tillington, Hereford.
Phayre, Lt.-Col. R., O.B.E., D.L. ..	Belgaum, Park Road, West Woking, Surrey.
Pierce, F. G. ..	Orchard Place, Comp, Boro' Green, Kent.
Pounds, A. W. ..	The Kerne, Pottersheath, Welwyn, Herts.
Poupart, J. ..	Holly Farm, Walton-on-Thames, near Kingston, Surrey.
Pree, De, Maj.-General H., C.B., C.M.G., D.S.O.	Oak Hill House, Beckley, Sussex.
Prichard, General C. S. ..	Princes Risborough, Bucks.
Pye, L. K. ..	Burleigh, Cobham, Gravesend, Kent.
Quayle, J. B. ..	Valley Farm Bungalow, Brantham, Manningtree, Essex.
Rickwood, H. J. ..	Linkhorns, Ashurst, Kent.
Ridgwell, H. ..	Mill House, Orsett, Grays, Essex.
Reynolds, E. ..	Watford Grammar School, Rickmansworth Road, Watford, Herts.
Rietsema, Dr. I. ..	12 Teteringsche Dijk, at Breda, Holland.
Roger, R. V. ..	The Nurseries, Pickering, York.
Rowntree, B. S. ..	The Cocoa Works, York.
Sale & Son ..	Nurserymen, East Berks Seed Warehouse, Wokingham, Berks.
Sawers, B. L. ..	Curtisden Green, Goudhurst, Kent.
Scrutton, M. E. ..	Magpies, Chalfont St. Giles, Bucks.
Slocock, W. C. ..	Goldsworth Old Nursery, Woking, Surrey.
Smith, F. ..	Fant, East Peckham, Kent.
Smith, G. ..	Goose Green Farm, Hadlow, Tonbridge, Kent.
Sowrey, J. ..	Yeoveney Lodge Farm, Staines, Middlesex.
Starkey, J. R. ..	Norwood Park, Southwell, Notts.
Stephens, T. W. ..	82 Etwall Road, Hall Green, Birmingham.
*Stern, Miss R. F. ..	1 Dollis Hill Lane, London, N.W.2.
Steynor, R. L. ..	Dyke House Fruit Farm, Dymock, Gloucester.
Stokes, J. M. ..	Grower and Merchant, Evesham, Worcester.
Strouts, E. W. ..	Bishopsdale Farm, Biddenden, Kent.
Tate, Miss M. Y. E. ..	Hilden, Rye, Sussex.
Taylor, E. & Sons ..	Bell Farm, Barming, Maidstone, Kent.
Todd, Marshall A. ..	Worcestershire Club, Worcester.
Tompsett, P. & H. ..	Springfield Farm, Marden, Kent.
Trechman, N. G. ..	Fruit and Vegetable Grower, Pikelands, Harvington, Evesham, Worcester.
Turner, E. ..	Ministry of Agriculture, Wellington Place, Belfast.
Udall, S. ..	The Orchards, Yalding, Maidstone, Kent.
Vogelaar, T. A. ..	Fruitgrower, Krabbendijke, Holland.
Voss, W. & Co., Ltd. ..	Carlton Works, Glengall Road, Millwall, London, E.14.
Voysey, C. J. ..	Highdown Nurseries, Ferring, Sussex.

Walderslade Smallholders	Oakhurst, Tunbury Avenue, Walderslade, Kent.
Wallace, W. E., V.M.H.	Poplar Farm, Eaton Bray, Dunstable, Bedford.
Wallis, W. M. ..	Bekesbourne Hill, near Canterbury, Kent.
Warnock, J. ..	Garrion Farm, Wishaw, Lanarkshire.
Waterer, John, Sons & Crisp, Ltd. ..	Nurserymen, Twyford, Berkshire.
Watson, E. ..	Sunninglye, Pembury, Kent.
†Western, Capt. F. ..	Scraces, Barming, Kent.
Weston, H. B. ..	The Rocks, East Malling, Kent.
White & Hiller ..	Dunnington Heath Farm, Alcester, Warwickshire.
Wickham, R. D. ..	The Gate House, Brenchley, near Tonbridge, Kent.
Willis, Capt. G. H. A., C.B., R.N. ..	4 Lyndhurst Road, Hampstead, London, N.W.3.
Wimshurst, T. E. ..	Tibbs Court, Brenchley, Kent.
Wood, T. & Sons ..	Fruit Growers, The Mount Offices, Farningham, Kent.
Worts, Dr. C. ..	Penlan Hall, Fordham, Colchester, Essex.
Youatt, Dr. L. ..	Applegold, Little Leighs, near Chelmsford, Essex.
Youatt, Miss N. ..	Applegold, Little Leighs, near Chelmsford, Essex.
Youngman, W. H. ..	Charsfield, Woodbridge, Suffolk.

Donations to Development Fund, 1930.

Faversham Branch N.F.U.	33 Roman Road, Faversham, Kent.
Rothermere, Lord ..	Hotel Splendide, Piccadilly, London, W.
Wimbledon and District Gardeners' Mutual Improvement Society ..	Clive Cottage, 41 Richmond Road, West Wimbledon, London, S.W. 20.

RULES OF ASSOCIATE MEMBERSHIP OF THE KENT INCORPORATED SOCIETY FOR PROMOTING EXPERIMENTS IN HORTICULTURE.

THE RESEARCH STATION, EAST MALLING, KENT.

There are three Groups of Associate Members :—

Group A.—(Associate Members) "Founders."

Membership of this group is obtained by :—

A Single donation of £25 for Life Founders.

An annual subscription of £10 10s. for Annual Founder Members.

Founder Members are entitled :—

i. To receive the Annual Report of the Society, together with the supplement of special articles, free.

ii. To receive all other reprints and bulletins free.

iii. (*a*) To share (proportionately) in any distributions of selected material, at prices fixed by the Committee, and to be notified of such distributions and prices.

(*b*) To have priority in the matter of sharing in any distributions of novelties (if any) raised by the Station.

iv. To have advisory letters answered without a fee being charged.

v. (*a*) To receive special consideration in the matter of advisory visits, the identification of bushes, stocks, canes, etc.

(*b*) To obtain a reduction of fee where special services (such as the "roguing" of stock beds, etc.), involve extended journeys and visits.

vi. To be notified of and eligible to attend all meetings of Associate Members, of which there shall be at least one annually for Founder, Associate and Fellow Associate Members.

vii. To be notified of and eligible to attend all General Meetings of the Society.

Group B.—(Associate Members) "Fellows."

Membership of this Group is obtained by :—

A single donation of £15 15s. for Life Fellows.

An annual subscription of £3 3s. for Annual Fellows.

Fellows are entitled to :—

i. Similar to Group A.

ii. To receive on application all other reprints and bulletins at cost price.

iii. (*a*) Similar to Group A.

iv. Similar to Group A.

v. (*a*) Similar to Group A.

vi. Similar to Group A.

vii. Similar to Group A.

Group C.—(Associate Members) "Associates."

Membership of this Group is obtained by :—

A single donation of £10 for Life Associates.

An annual subscription of £1 1s. for Annual Associates.

Associates are entitled :—

i. To receive the Annual Report free.

ii. To receive on application the Supplement of special articles, and any other reprints and bulletins at cost price.

iii. (*a*) Similar to Group B.

iv. Similar to Groups A. and B.

vi. To be notified of and eligible to attend all Associates days, of which it is hoped to have at least one annually.

vii. Similar to Groups A. and B.

Societies, Associations, Clubs, etc., donating or subscribing similar sums corporately will be admitted to Associate Membership on similar terms. They will be eligible for proportionate privileges for their Members and to send representatives to the General Meetings. Such Associations will also have a prior claim upon the services of any Member of Staff prepared to give Lectures.

All Annual Subscriptions are payable for the Calendar year (January to December). *If the subscription is three months overdue no further reports or notifications will be sent and membership will lapse.*

Life Membership donations may be sent at any time.

In filling up the application form for Membership (at the end of the Report) each prospective member is invited to state the privileges he wishes to exercise.

THE KENT INCORPORATED SOCIETY FOR PROMOTING EXPERIMENTS IN HORTICULTURE.

THE RESEARCH STATION, EAST MALLING, KENT.

COMPLETE LIST OF MEMBERS OF THE SOCIETY.

Group A.—(Associate Members) "Founders."

Life Founders.

Ashcombe, Lord	..	Denbies, Dorking, Surrey.
Barnham Nurseries Co.	..	Barnham Junction, Sussex.
Bartholomew, P.	..	Westwood House, Southfleet, Kent.
Bath & Co., Ltd.	..	The Floral Farms, Wisbech, Cambridge.
Berry, Sir W. W.	..	Gushmere Court, Faversham, Kent.
Borton, Col. A. C. (late)	..	Cheveney, Hunton, Maidstone, Kent.
Brunner, Sir John (late)	..	Sandiway House, Northwich, Cheshire.
Bunyard & Co.	..	The Royal Nurseries, Maidstone, Kent.
Cadbury, Messrs.	..	Bourneville Village Trust, Estate Office, Birmingham.
Cambridge West Growers' Association. (Paskett, A. T.)	..	County Hall, Cambridge.
Canterbury Farmers' Club and East Kent Chamber of Agriculture	..	2 New Dover Road, Canterbury, Kent.
Chambers, E. H.	..	East Hall, Boughton Monchelsea, Kent.
Chambers, J. J.	..	Manor House, Southfleet, Gravesend, Kent.
Chambers, P.	..	Shepway Court, Maidstone, Kent.
Champion, B.	..	Baron's Place, Mereworth, Kent.
Chaytor, A. D.	..	Iridge Place, Hurst Green, Sussex.
Chivers & Sons, Ltd.	..	Estate Office, Histon, Cambridge.
Clarke, Foster	..	Boughton Mount, Maidstone, Kent.
Cobb, Robert (Junr.)	..	Castle Chambers, Rochester, Kent.
Cohen, Lady Louisa	..	Highfield, Shoreham, Kent.
Collet, Sir Mark	..	St. Clere, Kemsing, Sevenoaks, Kent.
Colthup, W.	..	Hopebourne, Harbledown, Canterbury, Kent.

Cooper, McDougall & Robertson, Ltd.	The Chemical Works, Yalding, Kent.
Cornwallis, Rt. Hon. Lord	Linton Park, Maidstone, Kent.
Dalgleish, J. E.	The Nurseries, Market Weighton, York.
Dartford Branch, N.F.U.	13b Lowfield Street, Dartford, Kent.
Dean, G. H.	Whitehall Preserve Works, Sittingbourne, Kent.
Dennis, W., & Sons	Kirton, near Boston, Lincs.
Drake & Fletcher, Ltd.	Kentish Engineering Works, Broadway, Maidstone, Kent.
Dunstan, M. J. R. (Hon. Member)	Windyacre, Wrotham Hill, Kent.
Durham, Dr. H.	Dunelm, Hereford.
Edmonds, J., & Sons	Allington, Maidstone, Kent.
Elms, F. A.	Days Lane Farm, Sidcup, Kent.
Emmet, Thomas	Amberley Castle, Amberley, Sussex.
Engelmann, C.	Carnation Grower, Saffron Walden, Essex.
Faulkner, J.	Maribel, Fairseat, Wrotham, Kent.
Faversham Branch, N.F.U.	21 South Road, Faversham, Kent.
Fox, Messrs. C. M., Ltd.	Brook Farm, Marden, Kent.
French, J. Hillier (Hon. Member)	9 King Street, Maidstone, Kent.
George, The Rt. Hon. David Lloyd, O.M., M.P.	Bron-y-de, Churt, Surrey.
Goodwin, E.	Canon Court, Wateringbury, Kent.
Greenwell, Sir Bernard	Estate Office, Marden Park, Woldingham, Surrey.
Guinness, The Rt. Hon. Walter, D.S.O., M.P.	10 Grosvenor Place, London, S.W.1.
Hardy, The Rt. Hon. Laurence	Sandling Park, Hythe, Kent.
Harlow, T.	The Pines, Matfield, Kent.
Harris, Lord	Belmont, Faversham, Kent.
Hart, D. B.	Singleton, Benenden, Kent.
Higgs, J. M., Exors. of	Farnborough Hall Farm, Farnborough, near Sevenoaks, Kent.
Honeyball, Col. J. F. (late)	Newgardens, Teynham, Kent.
Hop Control	7 Southwark Street, London, S.E.1.
Hinge, John	Brompton Farm, Frindsbury, near Rochester, Kent.
Hudson, W. S.	Park Gate Farm, Tenterden, Kent.
Hussey, E. W.	Scotney Castle, Lamberhurst, Kent.

Imperial Chemical Industries, Ltd.	Millbank, London, S.W.1.
Institute of Brewing	Brewers' Hall, Addle Street, London, E.C.2.
Kent Education Committee. (Davies, E. Salter)	Springfield, Maidstone, Kent.
Kitchin, J.	Boughton Place, Sandway, near Maidstone, Kent.
Langland, J.	Darenth Court Farm, Darenth, Dartford, Kent.
Lee, C., & Son	Crockenhill, Swanley, Kent.
Low, Stuart	Dingleden Fruit Farm, Benenden, Kent.
Maidstone Branch, N.F.U.	6-8 Market Buildings, Maidstone, Kent.
Manwaring, P.	4 Knole Paddock, Sevenoaks, Kent.
Maxse, General Sir Ivor	The Maxey Fruit Co., Ltd., Fittleworth, Sussex.
May, Stuart	Gallants Farm, East Farleigh, Maidstone, Kent.
May, G.	Oakmount, Allington, Maidstone, Kent.
McAndrew, Miss (late)	Guildables, Edenbridge, Kent.
Merryweather, H., & Sons, Ltd.	The Nurseries, Southwell, Notts.
Miller, G. J.	Court Lodge Farm, Chelsfield, Kent.
Miller, A. T.	Wested Farm, Swanley, Kent.
Miskin, G. V.	Ifield Court, Gravesend, Kent.
Mond, Dr. R. L., F.R.S.E., LL.D.	9 Cavendish Square, London, W.1.
Mount, H. G.	The Nurseries, Canterbury, Kent.
Mount, S. W.	Hode Farm, Patrixbourne, Canterbury, Kent.
Murdoch, Col. Clive	Westerhill, Linton, Maidstone, Kent.
National Federation of Fruit and Potato Growers	Russell Chambers, Market Square, Covent Garden, London, W.C.2.
Neame, Messrs. F. & T.	The Offices, Macknade, Faversham, Kent.
Nettlefold, A.	The Park, Wrotham, Kent.
Notcutt, R. C., J.P., F.L.S.	Woodbridge, Suffolk.
Overy, E. I.	Mascalls Court, Paddock Wood, Kent.
Pearson, W., & Sons	The Nurseries, Lowdham, Nottingham.
Perree, J. A.	Oaklands, St. Saviours, Jersey.
Phillpotts, G. S.	Oakfield, Foxrock, Co. Dublin, Ireland.
Pickstone, H. E. V.	Lekkerwijn, P.O. Groot Drakenstein, Cape Province, Union of South Africa.

Podmore, J. H. ..	Moatlands, Paddock Wood, Kent.
Prall & Sons ..	Matfield Nurseries, Paddock Wood, Kent.
Rivers, Messrs. ..	The Nurseries, Sawbridgeworth, Hertfordshire.
Robertson, J. M. ..	Beluncle, Hoo, Rochester, Kent.
Rochester Branch, N.F.U. ..	43 High Street, Rochester, Kent.
Rogers, Samuel ..	Roselands, Mottingham Lane, Eltham, London, S.E.9.
Rogers, W., C.C. ..	Court Lodge, Horton Kirby, Kent.
Rothermere, Lord (Hon. Member)	Hotel Splendide, Piccadilly, London, W.
Sittingbourne Branch, N.F.U.	Finch's Farm, Milstead, Sittingbourne, Kent.
Skinner, Thornton ..	White Lodge, Boughton Monchelsea, Kent.
Smeed, Dean & Co., Ltd. ..	Murston, Sittingbourne, Kent.
Smith, Selby ..	Hall Place, Barming, Maidstone, Kent.
Smith, F. ..	Loddington, Linton, Maidstone, Kent.
Smith, C. S. ..	Elm House, Boughton Monchelsea, near Maidstone, Kent.
Smith Bros. ..	Land Agents, Boughton Monchelsea, near Maidstone, Kent.
Spence, Howard M. I., Chem.E. ..	The Red House, Ainsdale, Southport, Lancs.
Spooner & Sons ..	The Nurseries, Hounslow, Middlesex.
States Committee of Agriculture ..	Greffe Office, St. Helier, Jersey.
Stewart, Jas. (late) ..	Bloors Place, Rainham, Kent.
Surrey Branch, N.F.U. ..	Market Buildings, Guildford, Surrey.
Sussex East County Council Agricultural Committee. (Johnson, G. C.) ..	County Hall, Lewes, Sussex.
Sussex West County Council Agricultural Committee ..	County Hall, Chichester, Sussex.
Thomas, W. J. ..	Brownings, Rodmersham, near Sittingbourne, Kent.
Tolhurst, Thos. ..	Bennetts Farm, Horsmonden, Kent.
Tolhurst, W. H. ..	The Palace Hotel, Southend-on-Sea, Essex.
United Potash Co., Ltd. ..	Fenton House, 112 Fenchurch Street, London, E.C.3.

Vinson, A., Exors. of . . Parsonage Farm, Belvedere, Kent.
Vinson, Edwin (late) . . High Croft Hall, Swanley, Kent.
Vinson, H. . . Hurst Farm, Bexley, Kent.
Vinson, R. . . Nettlestead Court, Wateringbury, Kent.
Vinson, W., Exors. of . . Hall Place, Barming, Maidstone, Kent.

Weeks & Son . . Perseverance Iron Works, Maidstone, Kent.
Wellington, Capt. R. (Hon. Member) Worth, Hele, Bradninch S.O., Devon.
Whitbread & Co., Ltd. . . Beltring, Paddock Wood, Kent.
Wolmer, Lord . . Blackmoor, Liss, Hampshire.
Wood, M. S. . . Beacon House, Green St. Green, Dartford, Kent.

Group A.—"Annual Founders."

Chivers & Sons, Ltd. . . Estate Office, Histon, Cambridge.

Hardy, The Rt. Hon. Laurence . . Sandling Park, Hythe, Kent.

Norfolk County Council . . The Shirehouse, Norwich, Norfolk.

Spence, Howard, M.I., Chem.E. . . The Red House, Ainsdale, Southport, Lancs.

Wolmer, Lord . . Blackmoor, Liss, Hampshire.

Group B.—(Associate Members) "Fellows."

Life Fellows.

Aitkenhead, R. . . Tongswood, Hawkhurst, Kent.
Amos, Alfred (late) . . Springrove, Wye, Kent.
Anderson, J. A., Exors. of . .
Armytage, G. (late) . . Hoo Lodge, Borstal, Rochester, Kent.
Arnold, Messrs. . . Branbridges, Paddock Wood, Kent.
Ashford Branch, N.F.U. . . 2a Bank Street, Ashford, Kent.
Aveling, T. T. . . Boyley Hill House, Rochester, Kent.

Ballard, W. C. . . Hillside, Broom Hill, Rochester, Kent.
Basham, J., & Sons . . Fairoak Nurseries, Bassaleg, Newport, Mon.

Batchelor, G. A., Successors of	Galtons Farm, Cliffe, Kent.
Bearsted, Lord (late) ..	The Moat, Maidstone, Kent.
Bell, Lt.-Col. M. (late) ..	Bishopsbourne, near Canterbury, Kent.
Bellairs, Com. C. ..	Gore Court, Otham, Maidstone, Kent.
Bellingham, W. J. ..	Vinters Farm, Boxley, Maidstone, Kent.
Benenden Branch, N.F.U. ..	Bishopsden Farm, Benenden, Kent.
Bide & Son ..	Alma Nurseries, Farnham, Surrey.
Blackmore, H. ..	Littledown, Lamberhurst, Kent.
Blundell, H. ..	The Laurels, Halstead, Sevenoaks, Kent.
Body, Colonel John ..	Wittersham Court, Wittersham, Kent.
Booth, Sir Gore ..	Lissadell Nurseries, Sligo, Ireland.
Bourne, Felix ..	226 High Street, Chatham, Kent.
Brice, W. ..	Mockbeggar, Higham, Kent.
Brice, W. St. John ..	Hoo Lodge, near Rochester, Kent.
Camden, Marquis ..	Bayham Abbey, Lamberhurst, Kent.
Canterbury Branch, N.F.U.	11 St. Margaret's Street, Canterbury, Kent.
Chambers, H. G. ..	Greenhill, Otham, Maidstone, Kent.
Champion, B. A. ..	13b Lowfield Street, Dartford, Kent.
Cheetham, Capt. C. E. ..	Poplar Hall, Faversham, Kent.
Clark, Messrs. G. A. ..	The Nurseries, Dover, Kent.
Clark, W. F. ..	Kenaway, Ospringe, Faversham, Kent.
Clay, Col. H. Spender ..	Ford Manor, Lingfield, Surrey.
Collyer, B. ..	Cart House Lane, Horsell, Woking, Surrey.
Coombes, F. ..	Mill Lane Nursery, Bebington, Cheshire.
Crawford, T. ..	Gore House, Upchurch, Sittingbourne, Kent.
Crowhurst, A. S. ..	Charton Farm, Farningham, Kent.
Daniels Bros., Ltd. ..	Royal Norfolk Seed Establishment, Norwich, Norfolk.
Daw, F. B. ..	Woodlands, Shiplake, Henley-on-Thames.
Day, Ed. ..	The Thorn, Marden, Kent.
Day, Geo. ..	North Ash Farm, Ash, Wrotham, Kent.
Day & Tassell, Messrs. ..	Tutsham Farm, West Farleigh, Maidstone, Kent.
Dixon, W. R., Exors. of ..	Cambridge, Lynsted, Kent.
Edgecombe, G. R. ..	Whinlatter, Strawberry Hill, Tunbridge Wells, Kent.
Egerton Branch, N.F.U. ..	Court Lodge, Egerton, Kent.
Elgar, W. R. ..	The Limes, Sittingbourne, Kent.
English, O. ..	Manor Farm, Wateringbury, Kent.
English, W. D. ..	Chapter Farm, Rochester, Kent.

Falmouth, Viscount	..	8 Lennox Gardens, London, S.W.1.
Favell, C. R.	..	Crundall's Fruit Farm, Matfield, Kent.
Finn, G. W., & Sons	..	The Mall, Faversham, Kent.
Francis, D. L.	..	Green Trees, near Tonbridge, Kent.
Francis & Ackworth	..	Howberry Farm, Erith, Kent.
Fremlin, Messrs., Ltd.	..	Pale Ale Brewery, Earl Street, Maidstone, Kent.
French, W.	..	Hooks Place Farm, Southfleet, Gravesend, Kent.
Gascoyne, E. B.	..	Bapchild Court, Sittingbourne, Kent.
Gaskain, W. F.	..	Dargate, Faversham, Kent.
Gibson, B. L.	..	East Wickham Farm, Welling, Kent.
Gill, Major J. H.	..	Foxglove, Willesborough, near Ashford, Kent.
Goldsmid, E. d'A.	..	Somerhill Gardens, Tonbridge, Kent.
Goodwin, W. Gordon	..	Elliot's Farm, Penshurst, Kent.
Goodwin, W.	..	Paul's Farm, Leigh, Tonbridge, Kent.
Greenless, W.	..	Woodgate Farm, Borden, Sittingbourne, Kent.
Grubb, N. H.	..	The Research Station, East Malling, Kent.
Gunther, C. E.	..	Tongswood, Hawkhurst, Kent.
Gurr, Hy.	..	48 Maidstone Road, Chatham, Kent.
Haggard, A.	..	Manager, The Hilltop Fruit Farm, Ledbury, Herefordshire.
Hales, H.	..	Paradise Farm, Hartlip, Sittingbourne, Kent.
Hampshire Branch, N.F.U.		Westgate Chambers, Winchester, Hants.
Hardy, L.	..	The Vale, Addington, West Malling, Kent.
Haviland, Dr. F.	..	Branksome House, St. Leonards, Sussex.
Haynes, L. P.	..	Ockham, Bodiam, Hawkhurst, Kent.
Higgs, J. V.	..	Owens Court Farm, Selling, Kent.
Hillier & Sons	..	West Hill Nurseries, Winchester, Hants.
Hinge, A.	..	Homestead, Borden, Sittingbourne, Kent.
Hollands, E.	..	Green Farm, Shorne, Gravesend, Kent.
Holm, J. C.	..	Allhallows, Rochester, Kent.
Hubble, W. W.	..	Harbledown, Canterbury, Kent.
Hubble, Messrs.	..	Hunton Court Farm, Hunton, Maidstone, Kent.
Ingleton, E. J.	..	Glencoe, 50 Campbell Road, Gravesend, Kent.
Jackman, G., & Son	..	The Nurseries, Woking, Surrey.
Jackson & Sons	..	Hockenden, Swanley, Kent.
Jones, L. (late)	..	Plantation, Stock, near Ingatestone, Essex.
Kelsey, E. B.	..	Wickham Court, Canterbury, Kent.
Kings Acre Nurseries	..	Hereford.

Large, J. D.	..	Cherry Gardens, Goudhurst, Kent.
Lawrey, John	..	Covent Garden Market, London, W.C.
Laxton Bros.	..	63 High Street, Bedford.
Leney, Hy.	..	Selling Court, Faversham, Kent.
Linfield, A. G.	..	The Pallant, Chesswood Road, Worthing, Sussex.
Little, S. H.	..	Crouch, Borough Green, Sevenoaks, Kent.
London School Gardening Association	..	95 Arngask Road, Catford, London, S.E.6.
Long, Glover	..	Dairy Farm, Higham, Rochester, Kent.
Lumsden, J.	..	The Dell, Stone Street, Sevenoaks, Kent.
Manger & Henley, Messrs.	..	59 High Street, Borough, London, S.E.1.
Mannington, E.	..	Tanner House, Marden, Kent.
Marden Fruit Growers' Association	..	Marden, Kent.
Marsham, G. (late)	..	Hayle Cottage, Maidstone, Kent.
Maxted, J. D.	..	Newlands, Teynham, Kent.
Maxwell, W.	..	Westwood Farm, Sidcup, Kent.
McLean, T. B.	..	East Court, Chalk, Gravesend, Kent.
McLean, L.	..	Tong, near Gravesend, Kent.
Mercer, A. L.	..	North Court, Sittingbourne, Kent.
Mitchell, R., & D.	..	Pelican Farm, Wateringbury, Kent.
Morford, L.	..	Little Chillmill, Brenchley, Paddock Wood, Kent.
Nevill, The Hon. R. P. (late)		Birling House, Birling, West Malling, Kent.
Noakes, W. J.	..	Trottenden, Goudhurst, Kent.
North of England Horticultural Society	..	Preston Rectory, Lavenham, Suffolk.
Northampton Branch, N.F.U.		11 and 12 Lloyds Bank Chambers, George Row, Northampton.
Norton, Capt. R. A.	..	Downs House, Yalding, Kent.
Oyler, Potter	..	Fruit Growers, etc., Malt House, Lynsted, Kent.
Paddock Wood Branch, N.F.U.	..	Tudor House, King Street, Maidstone, Kent.
Pain, A. E.	..	Black Hall Farm, Sevenoaks, Kent.
Peerless, T.	..	Little Brook Manor, Dartford, Kent.
Pennell & Sons	..	Seed Merchants and Nurserymen, Lincoln.
Purcell, E.	..	Horticultural Instructor, St. Ita's, Banim Terrace, Kilkenny, Ireland.
Pye, Wm.	..	Jeskyns Court, Cobham, Rochester, Kent.
Pyne, G.	..	Denver Nurseries, Topsham, Devon.

Reader, H. ..	Pike Fish Farm, Yalding, Kent.
Rice, H. E. H. ..	North Court, Eastry, Kent.
Rogers, Lt.-Col. J. M. ..	Riverhill, Sevenoaks, Kent.
Sandford, T. C. G. ..	Preshute House, Marlborough, Wilts.
Scott, Mrs. F. ..	Westmoor, Rainham, Kent.
Seabrook & Sons, Ltd. ..	The Nurseries, Boreham, Chelmsford, Essex.
Sheldon, W. ..	Long Lane Farm (North), Bexley Heath, Kent.
Simmonds, C. ..	Stilstead, East Peckham, Kent.
Smith, N. King ..	King's Hill Farm, Borough Green, Sevenoaks, Kent.
Staplehurst Branch, N.F.U.	9a King Street, Maidstone, Kent.
Steel, Major Strang ..	39 Portman Square, London, W.1.
Stonham, H. (late) ..	Old Soar, Plaxtol, Sevenoaks, Kent.
Streeten, F. C. ..	High Hilden, Tonbridge, Kent.
Sutton, J. ..	Clement Street, Swanley, Kent.
Taylor, E., & Sons ..	Bell Farm, Barming, Maidstone, Kent.
Theosophical Educational Trust ..	Maryland, Letchworth, Herts.
Tompsett, B. H. ..	The Moors, Marden, Kent.
Treseder, W., & Co. ..	The Nurseries, Cardiff.
Tuff, B ..	Coombe Farm, Allhallows, Rochester, Kent.
Veitch & Sons ..	The Royal Nurseries, New North Road, Exeter, Devon.
Vinson, O. ..	Ruxley Farm, North Cray, Kent.
Wakeley Bros. (Rainham, Kent), Ltd. ..	Station Buildings, Rainham, Kent.
Warde, Sir Charles, Bart., O.B.E., D.S., J.P. ..	Barham Court, Maidstone, Kent.
Watson, W., & Son ..	Growers of Fruit Trees, Killiney, Co. Dublin, Ireland.
Webb, Lt.-Col. Lumley (late)	Tunstall, near Sittingbourne, Kent.
Wellband, H., & Sons (late)	Willow Tree House, Otford, Sevenoaks, Kent.
Wheler, Major Sir G. C. H.	The Oaks, Ospringe, Faversham, Kent.
Whitebread, A. E. ..	The Mount, Frindsbury, Rochester, Kent.
Whittall, W. J. H. ..	Grayswood Hill, Haslemere, Surrey.
Wickham & Co. ..	Congelow, Yalding, Kent.
Williams, Col. C. (late) ..	Ivy House, Edenbridge, Kent.
Wimshurst, T. ..	Tibbs Court, Brenchley, Kent.

Winch, W. H., & Sons	..	Stone Street, Cranbrook, Kent.
Wood, W. F.	..	Chekes Court, Sittingbourne, Kent.
Wood, W. S.	..	Rodfield, Sittingbourne, Kent.
Woodward, G., & Sons	..	Hayden Cross, Southfleet, Gravesend, Kent.
Worthington, G. W.	..	Wyecroft Manor, Axminster, Devon.

Group B.—"Annual Fellows."

Barton, J. L.	..	Broadwater, East Malling, Kent.
Bennett, H. E.	..	Ditton Court Farm, Larkfield, Maidstone, Kent.
Bugges Insecticides, Ltd.	..	London Road, Sittingbourne, Kent.
Buxton, A. F.	..	Fairhill, Tonbridge, Kent.
Cambridgeshire Education Committee (Paskett, A. T.)	..	County Hall, Cambridge.
Columbo Commercial Co., Ltd.	..	Thames House, Queen Street Place, London, E.C.4.
Essex, Sir R. Walter, I.P.	..	Dixcot, North Drive, Streatham, London, S.W.16.
Harrison, Rev. T., C.C.	..	"Cranford," Granville Road, Sevenoaks, Kent.
Hillier & Sons	..	Nurserymen, West Hill Nurseries, Winchester, Hampshire.
Holdsworth, R. K.	..	Belchambers Farm, Kirdford, near Billingshurst, Sussex.
Isle of Ely Education Committee	..	Education Offices, March, Cambs.
Linden, Van der H.	..	Carbokrimp Co., Ltd., St. Mary's Chambers, 161a Strand, London, W.C.2.
Mann, W. E.	..	Carmuirs, Soham, Cambs.
Morgan, R. C.	..	Little Whatmans, Biddenden, Kent.
Morley, C.	..	Station Nurseries, Fordham, near Ely, Cambs.
Murphy & Son, Ltd.	..	Wheathampstead, Herts.
Ogilvie, G. N.	..	Cox's, Harpenden, Herts.
Poix, R. de	..	Broome Fruit Farm, Ditchingham, Norfolk.

Richards, W.	..	Poulters, Bentley, Hants.
Robbins, A. J.	..	Vicarage Farm, Hounslow, Middlesex.
Tickler, T. G., Ltd.	..	The Fruit Farms, Bradley, near Grimsby, Lincs.
Warde, Sir Charles, Bart., O.B.E., D.S., J.P.	..	Barham Court, Maidstone, Kent.
West, Samuel	..	Ewhurst Place, Hawkhurst, Kent.

Group C.—(Associate Members) "Associates."

Life Associates.

Amos, Miss R. B.	..	Gosmere, Faversham, Kent.
Auger, W. J.	..	Magpie Hall Road, Chatham, Kent.
Balfour, The Hon. H. R. C.		Dunstead, Bures, Suffolk.
Ballard, G.	..	Grange Farm, Strood, Kent.
Bamber & Sons	..	The Norfolk Nurseries, Elm, Wisbech, Cambridge.
Barnes, T. G.	..	Mote Farm, Ivy Hatch, near Sevenoaks, Kent.
Batchelor, A. G.	..	Sharnal Street Farm, Hoo, Rochester, Kent.
Batchelor, R. D.	..	Darland House, Chatham, Kent.
Beauford, F. S.	..	Troston Hall, Bury St. Edmunds, Suffolk.
Beeton, H. R.	..	Hammonds, Checkendon, Reading, Berks.
Bellingham, H. A.	..	Upper Fant Farm, Maidstone, Kent.
Benstead, E. A.	..	The Lawn, Sittingbourne, Kent.
Bett, R.	..	Court Lodge Farm, Stoke, Kent.
Blest, F.	..	Wateringbury, Kent.
Bones, A. J.	..	Dargate, Faversham, Kent.
Brinkman Bros.	..	Chertsey Lane Nurseries, Chertsey, Surrey.
Burns, Major E. B.	..	Riverside, Yalding, Kent.
Calcutt, H.	..	Four Wents, Cranbrook, Kent.
Castle, W. H.	..	East Dene, Pean Hill, Whitstable, Kent.
Castle, G.	..	North Street Farm, Hoo, Rochester, Kent.
Cook, L. Morton	..	Campsie, Shoreham-by-Sea, Sussex.
Cooper, H. E. W.	..	Pot Kiln Farm, London Road, Tonbridge, Kent.
Cooper, J. A.	..	Orchard Dene, Chainhurst, Marden, Kent.
Corfe & Son, Ltd.	..	Agricultural Chemists and Fruit Spray Merchants, 5 Gabriels Hill, Maidstone, Kent.

Courthope, Col. Sir George Bart, M.C., M.P.	..	Whiligh, Sussex.
Cousens, P. H. (late)	..	Swanwick, Southampton.
Cox, P. W., M.B.E.	..	Rockside, Upper Fant Road, Maidstone, Kent.
Croft, Major O. G. S.	..	Hephill, near Hereford.
Crompton, T. E.	..	Week Green Nurseries, Petersfield, Hampshire.
Curling, J. H.	..	Perry Court, Faversham, Kent.
Darnley, Earl of	..	Puckle Hill, Cobham, near Rochester, Kent.
Day, Alfred	..	Great Tong, Headcorn, Kent.
Dennis, T. G.	..	Dunton Farm, Dunton Green, Kent.
Dennis & Cooper	..	Covent Garden Market, London, W.C.2.
Duckham, A.	..	Rooks Hill, Bitchett Green, near Sevenoaks, Kent.
Durling, W.	..	Ightham, Kent.
East, F. E. (late)	..	Matfield, Tonbridge, Kent.
Edmonds, J.	..	Hill Farm, Higham, Rochester, Kent.
Everest, W.	..	Crockenhill, Swanley, Kent.
Fife, J.	..	West Yaldham, Kemsing, Sevenoaks, Kent.
Finnis, J. T.	..	Collier Street, Marden, Kent.
Fisher, C.	..	Crescent Farm, Sidcup, Kent.
FitzWalter, Lord	..	Goodnestone Park, Canterbury, Kent.
French, P.	..	Teynham, Sittingbourne, Kent.
French, R. S.	..	Hoo Green, Meopham, Gravesend, Kent.
Fromow, W., & Sons	..	Windlesham Nurseries, Surrey.
Furner, W. G.	..	Fruit Grower, Venner's Farm, Erith, Kent.
Gillespie, D., B.Sc.	..	Barlings, Egerton, Ashford, Kent.
Glen, W.	..	Otford, near Sevenoaks, Kent.
Goodridge, Rear Admiral (late)	..	Rudgwick Fruit Farm, Rudgwick, Sussex.
Gribble, T.	..	Sutherland, Sutherland Avenue, Bexhill-on-Sea, Sussex.
Guilford, Earl of	..	Waldershare Park, Dover, Kent.
Hall, J., & E., Ltd.	..	Dartford, Kent.
Harden, H.	..	Wickhurst Farm, Sevenoaks, Weald, Kent.
Harrison, E. H.	..	Dux Court, High Halstow, near Gravesend, Kent.
Harthan, G. E., M.B., B.C.		Sheriffs Lench, Evesham, Worcs.
Hartley Bros.	..	Weavill's Fruit Farm, Fair Oak, Hants.
Highwood, W.	..	Hertsfield, Marden, Kent.

Hinds, W. T. (late)	Gilletts, Smarden, Kent.
Hollands, J., & F.	Kings Farm, Shorne, Gravesend, Kent.
Honness, A. W.	Great Cheveney, Marden, Kent.
Horne Bros.	Berry Hill, Cliffe, Kent.
Horrocks, W. E.	Wheatley, Retford, Notts.
Hubble, A. W.	The Elms, Hunton, Maidstone, Kent.
Hubble, T. W.	Elphicks, Hunton, Maidstone, Kent.
Hubble, W. L.	Cratloe, Faversham, Kent.
Ingleby, E. J.	The Forest and Orchard Nurseries, Milbury Heath, Falfield, Gloucester.
Ingleton, H. J.	Fenn Farm, St. Marys, Rochester, Kent.
James, A.	Chyngton House Gardens, Seaford, Sussex.
Jordan, Lt.-Col. P. C. L.	Stubble Hill, Harrietsham, Kent.
Kakebeeke, F.	Fruitgrower, Goes, Holland.
Kendall, C. T.	Home Farm, Shoreham, near Gravesend, Kent.
Kipping, H. G.	Bartrams Farm, Sevenoaks, Kent.
Kleinwort, H. G.	Amberfield Farm, Chart Sutton, Maidstone, Kent.
Latter & Sons	Borough, London, S.E.
Lawrence, Geo.	Hayle, Horsmonden, Kent.
Leney, P.	Eaton Cottage, Benenden, Kent.
Lennard, Sir H. F.	Wickham Court, Kent.
Lewis, E. H., & Son, Ltd.	25 James Street, Covent Garden, London, W.C.
Lewis, J.	Petham Court, Swanley Junction, Kent.
Lidiard, B. S.	Waltham St. Lawrence Fruit Farm, Twyford, Berks.
Lobjoit, Sir William, O.B.E., J.P.	Oakdene, Woodburn, Wooburn Green, Bucks.
Lupton, G. H.	Elgin, C. P., South Africa.
Mackinnon, Sir P. G.	High Quarry, Crockham Hill, Edenbridge, Kent.
Mackledon, E.	Grove House, Bobbing, near Sittingbourne, Kent.
Manwaring, H. T. W.	Plovers, Horsmonden, Kent.
Manwaring, W.	Martins Farm, Collier Street, Marden, Kent.
Marriage, W.	Brabourne Farm, Sevenoaks, Kent.
Matthews, J. H.	Calverts Buildings, 52 Borough High Street, London, S.E.1.
Maxted, J.	Rock Farm, Nettlestead, near Maidstone, Kent.
Mercer, R. M.	The Batteries, Lynsted, Kent.
Mercer, R.	Church House, Rodmersham, near Sittingbourne, Kent.

Miles, W.	..	Wall End Farm, Isle of Grain, Kent.
Millar, W. C.	..	Colgates, Halstead, Sevenoaks, Kent.
Miskin, W.	..	White Hall, Hoo, near Rochester, Kent.
Monckton, F. W. (late)	..	The Warren, Ightham, Kent.
Mount, Herbert	..	Woolton Farm, Bekesbourne, Canterbury, Kent.
Muggeridge, A.	..	Turkey Farm, Stoke, Kent.
Muggeridge, E.	..	White House Farm, Isle of Grain, Kent.
Muggeridge, J.	..	Mackays Court, Stoke, Kent.
Napier, J. R. H.	..	Little Slifehurst Farm, Kirdford, Sussex.
Nicholson, T. J.	..	Broad Ford, Horsmonden, Kent.
Nix, C. G. A.	..	Tilgate, Crawley, Sussex.
Norman, A. C.	..	The Rookery, Bromley Common, Bromley, Kent.
Northcote, H. H. S. (late)	..	"Chyngton House," Seaford, Sussex.
Osenton, Stanley	..	Dalhams Farm, High Halstow, near Sittingbourne, Kent.
Osenton, W. F.	..	Buckhole Farm, High Halstow, Rochester, Kent.
Palmer, R. E.	..	Park Farm, Brasted, Kent.
Payne, H.	..	Court Lodge Farm, West Farleigh, near Maidstone, Kent.
Pemberton, W. Leigh	..	Torry Hill, Frinsted, Kent.
Pye, J. W.	..	Ranscombe Farm, Cuxton, Rochester, Kent.
Pye, J., Successors of	..	Knights Place, Rochester, Kent.
Renwick, J.	..	Panthurst Farm, Weald, Kent.
Roberts, H. G.	..	Huntley Cottage, Budleigh Salterton, S. Devon.
Rogerson, S. C. (late)	..	Marden, Kent.
Rolvenden Branch, N.F.U.		Forsham Farm, Rolvenden, Kent.
Ryall, R. B.	..	Thatches, Brenchley, Kent.
Scott, E. L.	..	Cryals, Matfield, Kent.
Sedgwick, C.	..	Salter Heath Farm, Riverhead, Kent.
Skilton, W. F.	..	6 Market Square, Bromley, Kent.
Smith, Lee S. J. (late)	..	Larkfield, Maidstone, Kent.
Stern, Miss R. F.	..	1 Dollis Hill Lane, London, N.W.2.
Stevens, A.	..	Breach, Newington, Kent.
Stevens, E.	..	Uppertoes, Bobbing, near Sittingbourne, Kent.
Stevens, S.	..	Place Farm, Hartlip, Sittingbourne, Kent.
Strouts, R. S.	..	Court Hall, Sidbury, Sidmouth, Devon.
Strover, W. H.	..	The Cock Inn, Isle of Grain, Kent.

Thom, W. . .	Dynes Farm, Kemsing, Sevenoaks, Kent.
Thomson, D. . .	Westfield Farm, Addington, West Malling, Kent.
Townshend, H. S. Marsham	Scadbury Park, Chislehurst, Kent.
Tuff & Sons . .	Craggs Farm, Singlewell, Kent.
Vaux, G. C. . .	15 Cheyne Court, Flood Street, Chelsea, S.W.3.
Vint, C. . .	Drakes Broughton, Pershore, Worcester.
Walker, F. T. (late) . .	Dryhill Farm, near Tonbridge, Kent.
Waring, T. A. (late) . .	Chesterfield, Kent.
Waters, J. R. N. . .	Fawke Farm, Sevenoaks, Kent.
Weald of Kent Farmers' Club	Hancocks Farm, Cranbrook, Kent.
Westacott, P. . .	Turvins Farm, Cheveney, Kent.
Western, Capt. F. . .	Scraces, Barming, Maidstone, Kent.
Wheeler, L. . .	Bockingfold, Marden, Kent.
Wilthew, W. R. . .	The Court Lodge, Egerton, Kent.
Wittersham Branch, N.F.U.	The Boundary, Wittersham, Kent.

Group D.—"Annual Associates."

Alexander, W. . .	Home Farm, Eynsford, Kent.
Amos, A. . .	Spring Grove Farm, Wye, Kent.
Amos, Miss Mary . .	Beyton Cottage, near Bury St. Edmonds, Suffolk.
Ascherson, C. S. . .	15 Phillimore Gardens, London, W.8.
Aspland, A. Lees . .	"Kalgan," Welwyn, Herts.
Attrell, E. S. . .	Warren Fruit Farm, North Common, Chailey, Sussex.
Baiss, R. S. H. . .	Church House, Beckley, Sussex.
Barnes, W. . .	Southfield, Cooden, near Bexhill, Sussex.
Baskerville, J. A. . .	Peveril, West End, Kemsing, Sevenoaks, Kent.
Batt, Lt.-Col. R. B., C.B.S., M.V.O. . .	Gresham Hall, Gresham, Norwich, Norfolk.
Batten, S. D. . .	Countessmead, Tiverton, Devon.
Bear, E. M. . .	Fruit Farm, Magham Down, Hailsham, Sussex.
Belcher, W. S. . .	Church Farm, Waltham St. Lawrence, Twyford, Reading, Berks.
Bennett, Major J. Sterndale	Oaken Wood, Wateringbury, Kent.
Bennion, C. F. . .	Curly Dip, Budleigh Salterton, Devon.
Berry, H. A. . .	Iverley, near Stourbridge, Worcestershire.
Bevington, Mrs. Marion . .	Wybournes, Kemsing, near Sevenoaks, Kent.

Blakeman, A. J. ..	The Schools, Bowdon, Cheshire.
Bligh, E. R. ..	Goddard's Green Farm, Benenden, Kent.
Boddington, F. ..	The Manor Fruit Farm, Burghill, Hereford.
Borthwick, The Hon. Wm.	14 Wilton Crescent, London, S.W.1.
Bowra, C. A. V. ..	The Bower House, Ightham, Kent.
Bowring, Arthur ..	The Oaks, Goudhurst, Kent.
Bracher, H. C. ..	Place Farm, Ryarsh, Kent.
Bray, W., & Sons ..	Dartmoor Nurseries, Okehampton, Devon.
Briscoe, Dr. Charlton ..	30 Harley Street, London, W.1.
Bromley, N. B. Warner- ..	Finsbury House, Blomfield Street, London, E.C.2.
Brook, P. T. S. ..	Broad Oak Farm, Sturry, Canterbury, Kent.
Burnett, Dr. ..	34 High Street, Sevenoaks, Kent.
Burrell, R. J. ..	Risby Place, Bury St. Edmonds, Suffolk.
Calkin, W. Shand ..	The Hall, Hadiscoe, Norwich, Norfolk.
Carles, Miss H. M. ..	c/o G. H. Lupton, Esq., Elgin, C.P., S. Africa.
Carter & Blewitt, Ltd. ..	Fruit Growers and Nurserymen, Boxted, Colchester, Essex.
Chambers, Rev. F. ..	Lested Lodge, Chart Sutton, Kent.
Champneys, H. O. ..	The Grange, Lamberhurst, Kent.
Chandler, W. O., & Son ..	Goldstone, Ash, Canterbury, Kent.
Church, L. A. King- ..	Northfield, Albury, near Guildford, Surrey.
Clarke, Baron B. H. ..	Basketon Hall, Woodbridge, Suffolk.
Clark, Mrs. Lylie Pearce- ..	The Grey House, Sevenoaks, Kent.
Clayton, Collins ..	26 Market Place, Wisbech, Cambridge.
Connew, T. F. ..	St. Ronan's, Kingstonridge, near Lewes, Sussex.
Conway, Lady ..	Allington Castle, Maidstone, Kent.
Cook, L. Morton ..	Campsie, Shoreham-by-Sea, Sussex.
Cornwell, B. ..	Iona, Gore Court, Tunstall Road, Sittingbourne, Kent.
Cracknell, Miss ..	School of Nature Study and Gardening, Clapham, near Worthing, Sussex.
Cubitt, E. G. ..	Honing Fruit Farms, Honing, Worstead, Norwich, Norfolk.
Cunningham, Lt.-Col. C. C.	Morning Star, Elgin, South Africa.
Cutbush, Wm., & Son, Ltd.	The Nurseries, Barnet, Herts.
Dahl, C. G. ..	Alnarps Tradgardsskola, Akarp, Sweden.
Danreuther, W. ..	Battle Fruit Farm, Battle, Sussex.
Davies, Rev. W. A. ..	Bwlchgwyn Vicarage, Wrexham, Denbigh.
Day, A. J. (Messrs. J. Day & Sons) ..	Paley, Cranbrook, Kent.

Day, S.	Paris Farm, East Malling, Kent.
Densham, S. C.	Little Hickmotts, Marden, Kent.
Desboeux, H. A.	Battramsley Close, near Lymington, Hampshire.
Dixon, T., & M.	Tardebigge, Bromsgrove, Worcester.
Edmunds, Dr. A., C.B., F.R.C.S.	57 Queen Anne Street, Cavendish Square, London, W.1.
Elgar, N. E. B.	Stallance, Sutton Valence, Maidstone, Kent.
Esbjerg, Neils	Forsogsledor, Forsogsstationen, Blangsted pr. Odense, Denmark.
Everett, Major R. C.	Castlemer, Kingston, Lewes, Sussex.
Fillmer, Miss S.	Oakfield, Hassocks, Sussex.
Findlay Bros.	Springhill Nursery, Baillieston, near Glasgow, Lanarkshire.
Firkins, A. R., & G. W.	The Moor, Eardiston, Tenbury, Worcester.
Fleming, Owen	Toys Hill, Sevenoaks, Kent.
Forbes, Renny, & Co., Ltd.	Alperton, Wembley, Middlesex.
Freeman, E. H.	40 Chancery Lane, London, W.C.2.
French, J. Hillier	9 King Street, Maidstone, Kent.
Fryer, P. J.	Messrs. Wm. Cooper & Nephews (Aus.), Ltd., 4 O'Connell Street, Sydney, Australia.
Gale, A. W.	Ivyside, Marlborough, Wilts.
Gamble, Oswald	Dunedin, Mark Cross, near Tunbridge Wells, Kent.
Gay, Lt.-Col. C. H.	Higham Hall, near Rochester, Kent.
Gill, Major J. H.	Foxglove, Willesborough, near Ashford, Kent.
Goodhew, L. J.	8 East Street, Sittingbourne, Kent.
Goodson, S. G.	Frognall, Wickhambreaux, Canterbury, Kent.
Gooiland Nurseries (Wesseling, G., & Co.)	Naarden, Holland.
Gordon, Col. W. A.	Warwick Farm, Mulder's Vlei, Cape Province, South Africa.
Gracie, A. B.	Bigbury House, Harbledown, Canterbury, Kent.
Granger, H.	The Maldon Fruit and Poultry Farm, Maldon, Essex.
Green, L.	Cherry Trees, Tardebigge, Bromsgrove, Worcester.
Green, Capt. L. H.	The Whittern Farm, Lyonshall, Kington, Herefordshire.

Greenwell, Sir Bernard ..	Estate Office, Marden Park, Woldingham, Surrey.
Grey, Countess Mabel ..	Howick, Alnwick, Northumberland.
Groom, H. C., & Co. ..	Bellevue Farm, Guilden Sutton, Chester.
Gwynne, H. A. ..	Mawbyns, Little Easton, Dunmow, Essex.
Gwynne, Rev. R. L. ..	Little Easton Rectory, Dunmow, Essex.
Hales, A. T. ..	Gwelo Fruit Farm, Newington, Sittingbourne, Kent.
Hall, F. V. ..	The Pomona Garden Co., New North Road, Exeter, Devon.
Hall, Rev. R. ..	The Manse, Rescobie, Forfar.
Hammond, Miss M. R. ..	St. Georges Lodge, Cookham, Berks.
Harraway, T. H., & Son ..	The Nurseries, Warminster, Wilts.
Harthan, C. E., M.B., B.C.	Sherriffs Lench, Evesham, Worcester.
Hartley Agricultural Co-operative Society, Ltd.	Hartley, Longfield, Kent.
Have, A. Van der ..	Kapelle, Bij Goes, Holland.
Hayman, Dr. W. S. ..	39 South Drive, Queen's Park, Bournemouth.
Head, W. ..	Government Botanic Gardens, Saharanpur, United Provinces, India.
Heyst, Van B. G. ..	Mauritsstraat 83, Ultrecht, Holland.
Highwood, W. ..	Hertsfield, Marden, Kent.
Hitchins, P. E. N. ..	Stream View Nursery, Horeham Road, Sussex.
Hollands, W. T. ..	Court Lodge, West Malling, Kent.
Hopwood, W., & Son ..	58 High Street, Cheltenham, Gloucester.
Howard, J. K. R. ..	Solignum Ltd., 205 Borough High Street, London, S.E.1.
Hubsch, H. Schmitz- ..	Merten, Kreis Bonn, Germany.
Hubsch, Otto Schmitz- ..	Merten, Kreis Bonn, Germany.
Huxley, Henry ..	Wootton Close, Boars Hill, near Oxford.
Hynard, F. C. ..	Lower Austin Farm, Eynsford, Kent.
Jennings, W. J. ..	Kennington Hall, Ashford, Kent.
Jones, Mrs. Basil ..	Coney Hill, Hayes Common, Kent.
Jongh, Wed. P. De., Ltd ..	Nurseryman, Goes, Holland.
Keeble, F. ..	Brantham Lodge, Manningtree, Essex.
Kenyon, G. H. ..	Ricklesmere, Kirdford, near Billingshurst, Sussex.
Kingsley Fruit Farm and Nursery ..	Kingsley, Bordon, Hants.
Kirkhope, W. G. ..	Felmere, Felbridge, East Grinstead, Sussex.
Kroon, P. ..	Sappemeer, Holland.

Lacey, G. H.	Warmley, near Bristol.
Lambert, Lieut. D. M.	Puxted, Brenchley, Kent.
Lamont, J. C.	Gedges Hill, Matfield, Kent.
Landale, Capt. H. R.	Ewell Manor, West Farleigh, Kent.
Lawrence, F., & J.	Dabb's Place Farm, Cobham, Kent.
Lees, Herbert	Holmefields, Tenbury Wells, Worcester.
Lewis, N. S.	Mumford, Wittersham, Kent.
Lowndes, Miss R.	Broad Oak, Buxted, Sussex.
Luck, Col. B. J. M.	The Hermitage, West Malling, Kent.
MacFarlan, Lt.-Col. J. B.	Invermay, Knowle, Budleigh Salterton, Devon.
Machin, N. F.	Redhill Farm, Wateringbury, Kent.
Marten, Sir Amberson	Gedges, Matfield, Paddock Wood, Kent.
Matthews, F. P.	The Nurseries, Harlington, Hayes, Middlesex.
Mathiesens Planteskole	Korsor, Denmark.
McLysaght, E.	Hazelwood, Mallow, Co. Cork, Irish Free State.
Men of the Trees (Duff, The Hon. Mrs. Grant)	32 Warwick Road, London, S.W.5.
Miles, W., & Co., Ltd.	16 Church Road, Hove, Sussex.
Miller, R. H.	Palace Hotel, Jersey.
Mitchell, W. H.	Orchard House, Westwick, Norwich, Norfolk.
Molesworth, S. F.	Sunridge Farm, Boughton Aluph, Ashford, Kent.
Monins, J. E.	Ringwould, near Dover, Kent.
Moore, F. W., & Co., Ltd.	Clarence House, 8 Arthur Street, London, E.C.4.
Moseley, R.	Sherfield English, Romsey, Hants.
Mount Barker Fruitgrowers' Co-operative Society, Ltd.	Mount Barker, Western Australia.
Murton, E.	Langton, Hawksdown, Walmer, Kent.
Neill, S. B.,	Sunnyhaye Fruit Farm, Woodbury, near Exeter, Devon.
Noble, Major W. J. W.	Mayfield, Kingswood Road, Shortlands, Kent.
Norbury, F. P.	Sherridge, near Malvern, Worcester.
Norfolk East Fruit Growers' Association	Wroxham, Norfolk.
Norton, Capt. R. A.	Downs House, Yalding, Kent.
Nume, B.	Rackham Cottage, Greatham, Pulborough, Sussex.
O'Brien, Hugh V.	Monare, Foynes Island, Limerick, Irish Free State.

Padwick, H. F.	..	The Red House, Ashling, Chichester, Sussex.
Pardoe, Capt. F. S.	..	Haxeldene, Horeham Road, Sussex.
Parsons, J. R.	..	Little Gillions, Croxley Green, Herts.
Parsons, T. E.	..	Standen Farm, Benenden, Cranbrook, Kent.
Peet, H. F.	..	Glenbrook, Delgany, Co. Wicklow.
Pewtress, The Misses M. A., & D. H.	..	Fruit Growers, Tillington, Hereford.
Phayre, Lt.-Col. R., O.B.E., D.L.	..	Belgaum, Park West Road, Woking, Surrey.
Pierce, F. G.	..	Orchard Place, Comp, Boro' Green, Kent.
Pounds, A. W.	..	The Kerne, Pottersheath, Welwyn, Herts.
Poupart, J.	..	Holly Farm, Walton-on-Thames, near Kingston, Surrey.
Pree, Major-Gen. H. De., C.B., C.M.G., D.S.O.	..	Oak Hill House, Beckley, Sussex.
Prichard, Gen. C. S.	..	Princes Risborough, Bucks.
Pye, L. K.	..	Burleigh, Cobham, Gravesend, Kent.
Quayle, J. B.	..	Valley Farm Bungalow, Brantham, Manningtree, Essex.
Reynolds, E.	..	Watford Grammar School, Rickmansworth Road, Watford.
Rickwood, R. J.	..	Linkhorns, Ashurst, Kent.
Ridgwell, H.	..	Mill House, Orsett, Grays, Essex.
Rietsema, Dr. I.	..	12 Teteringsche Dijk, at Breda, Holland.
Rigden, Charles	..	Plumford Farm, Ospringe, Faversham, Kent.
Rimmer, John	..	Roby Farm, Roby, near Liverpool, Lancs.
Roberts, A. E.	..	The Nurseries, Swanwick, Hampshire.
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Smith, G.	..	Goose Grene Farm, Hadlow, Tonbridge, Kent.
Sowrey, J.	..	Yeoveney Lodge Farm, Staines, Middlesex.

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Strouts, E. W.	..	Bishopsdale Farm, Biddenden, Kent.
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Todd, M. A.	..	Lee Cottage, Sheringham, Norfolk.
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Youatt, Miss M. ..	Applegold, Little Leighs, near Chelmsford, Essex.
Youatt, Dr. L. ..	Applegold, Little Leighs, near Chelmsford, Essex.
Youngman, W. H. ..	Charsfield, Woodbridge, Suffolk.

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